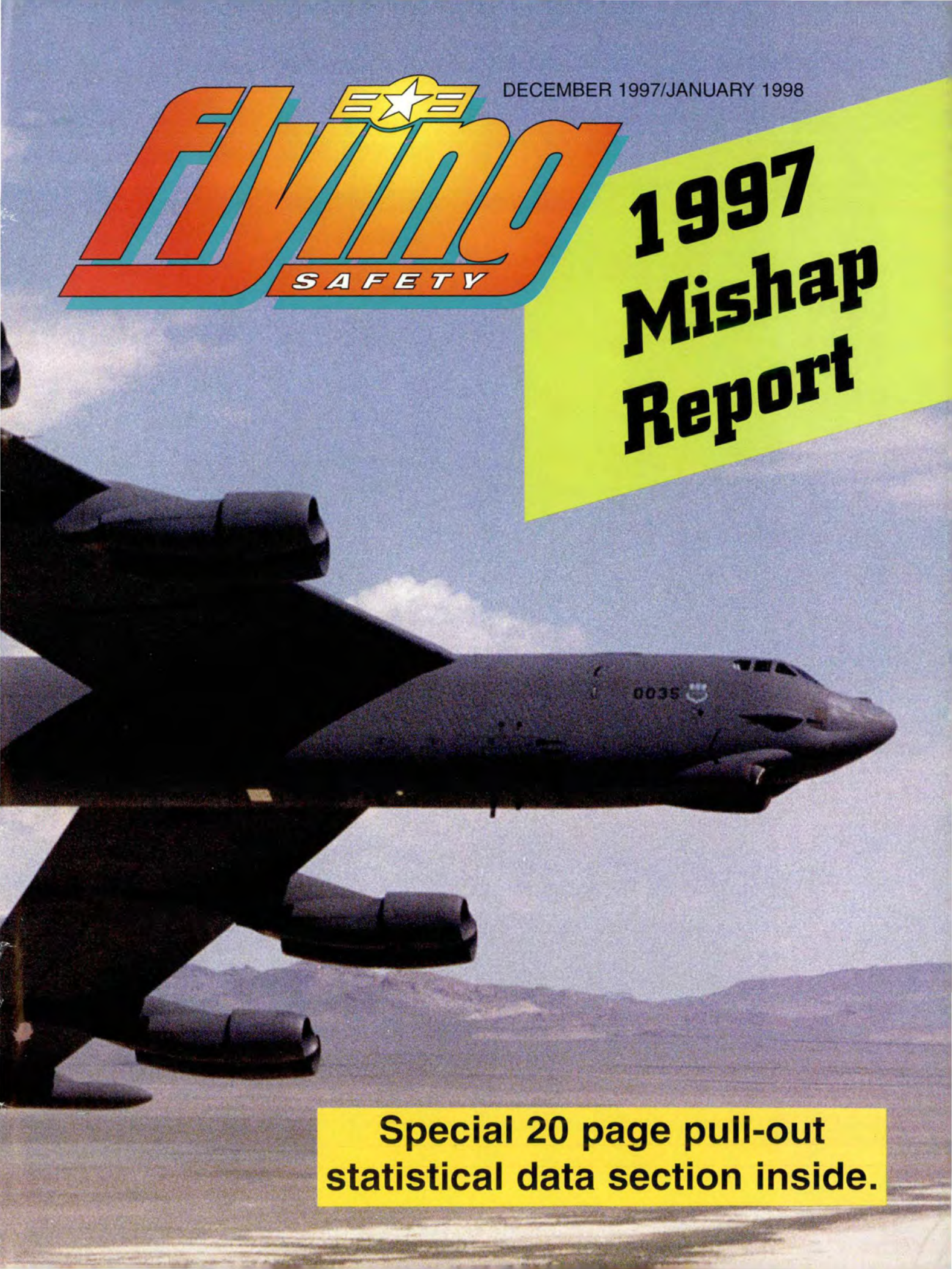
DECEMBER 1997/JANUARY 1998

flying SAFETY

1997 Mishap Report



Special 20 page pull-out statistical data section inside.

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PURPOSE — *Flying Safety* is published monthly to promote aircraft mishap prevention. Facts, testimony, and conclusions of aircraft mishaps printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in mishap stories are fictitious. The contents of this magazine are not directive and should not be construed as instructions, technical orders, or directives unless so stated. **SUBSCRIPTIONS** — For sale by the Superintendent of Documents, U.S. Government Printing Office (USGPO), Washington D.C. 20401; send changes of subscriptions mailings to the USGPO. Limited copies of back issues are available for official purposes. **REPRINTS** — Air Force organizations may reprint articles from *Flying Safety* without further authorization. Non-Air Force organizations must advise the Editor of the intended use of the material prior to reprinting. Such action will ensure complete accuracy of material amended in light of most recent developments. **DISTRIBUTION** — One copy for each three aircrew members and one copy for each six direct aircrew support and maintenance personnel. Air Force units must contact their base PDO to establish or change requirements.

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BASH

EUGENE LE BOEUF
MAJ PETE WINDLER
HQ AFSC/SEFW

If you read last year's edition of *Flying Safety's* 1996 mishap report, you may have noticed there was no end-of-the-year article specifically regarding BASH. While this may have been the case, bird strikes were noted as contributors to mishaps in the bomber, transport, AWACS, and trainer articles. With this in mind, the BASH Team thought it might be a good time to include our own end-of-the-year article in this year's edition of the mishap report.

So, will this information motivate the audience to a new level of understanding and action where all future bird/wildlife strikes will be eliminated? Let us answer that question by stating up front and for the record that the only way you can be sure you will never ingest a bird or be struck by some form of wildlife is to never crank the engine! With that said, let's look at some numbers and mishaps and see if we can learn something that may reduce the strike potential.

Although we have not had a Class A BASH mishap since the fatal E-3 bird strike in 1995, there have been many close calls. Remember, the difference between a nonreportable incident and a Class A may be only a matter of inches.

At the time of writing, it doesn't appear the total number of bird/wildlife strikes will be greater than last year. While this may be good news on the surface, further examination reveals some disturbing news. Damages are up from $5,215,083.52 in FY96 to $8,533,349.22 in FY97, *an increase of 64 percent*. To make matters worse, the FY97 cost figure does not include August and September! Although there is a high level of attention given to BASH, strikes continue to be a significant drain on already limited budgets and manpower.

Aside from the cost estimates, the statistical breakouts between FY96 and those we have compiled thus far for FY97 are not significantly different in categories such as strikes by month, time period, impact area, phase of flight, and altitude. Your best chance for striking a bird continues to be during the fall and spring migrations and when operating near the ground. Although no new "trends" emerged, other than increased cost, we may learn things from some consistency in certain data fields and from actual mishaps.

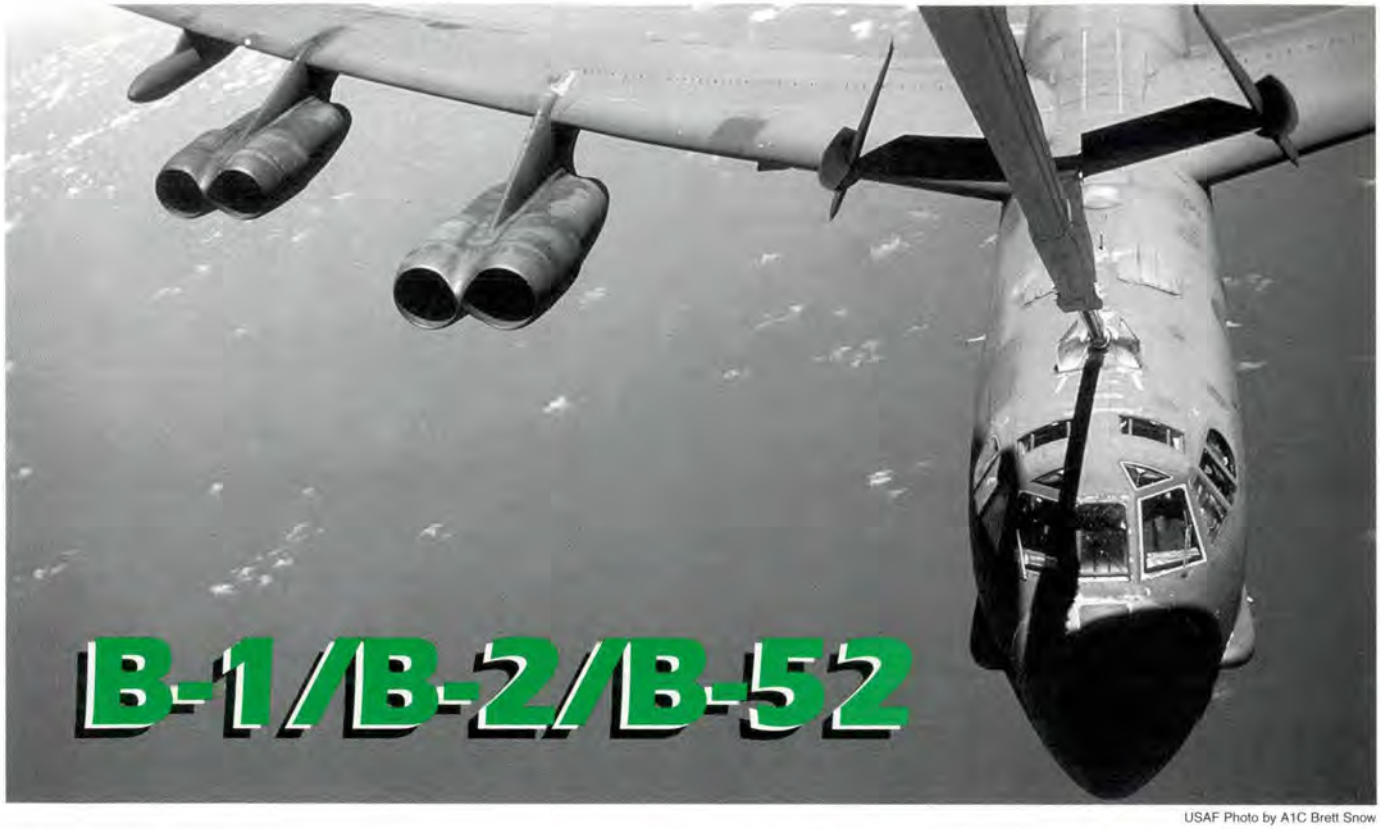
One statistic that doesn't vary from year to year is the altitude at which most birds are struck. A continuing trend is that most of our strikes (96 percent), where the altitude is known, occur at or below 2,000 feet above ground level (AGL). At least twice this year we have sustained damage from bird strikes which most likely could have been avoided by simply holding at a higher altitude.

Earlier this year there was a bird strike during an in-flight emergency that began with an "unpress door warning." While working the problem and holding at 1,900 feet AGL, the aircraft struck a bird, causing $69,000 damage to the aircraft.

Another incident occurred during a training exercise at a deployed location where there was no active BASH program. The training involved an aircraft holding at 1,500 feet over a low swampy area. Although the bird-watch condition code in the area of the airfield had been raised earlier in the week from low to moderate, the crew opted to fly the profile as planned due to complications in airspace scheduling. The net cost of this risk assessment was over $51,000. This is actually inexpensive when one considers what was said earlier, that a matter of inches could have resulted in far greater consequences.

According to our statistics, both incidents would have had a much better chance of avoiding birds and the associated headaches had they chosen to remain above 2,000 feet AGL. The message here is that operational risk management will work if it is used properly. If one takes the time to use the information on hand to guide decisions, we may just save time, money, and yes, even lives. Think about it!

NOTE: The BASH Team now has a page within the Air Force Safety Center's web site. Visit us on-line at www-afsc.saia.af.mil/AFSC/Bash/home. htm. ✈



USAF Photo by A1C Brett Snow

LT COL DAN STANTON
HQ AFSC/SEFO

Another year, another end-of-year *Flying Safety* article. When I tried to become a published author in the past, I couldn't. Now I have no choice. Such is life. Let us begin by reviewing the safety highlights of the B-1, B-2, and B-52 for FY97. Then I'll attempt to convince you of the importance of reporting mishaps of all sizes and varieties in a timely and detailed manner.

The mishap rates this year are not as good as last year's. We recorded one Class A mishap and experienced an increase in Class B mishaps from one (FY96) to three. The number of Class C mishaps more than doubled from last year (18 to 45). To stir the pot some more, the number of flying hours logged decreased by almost 25 percent from FY96. Onward with the details.

B-1

Flight Safety Officers (FSO) in the Lancer community were busy this fiscal year filling out mishap reports. The B-1 accounted for the one Class A mishap, all 3 Class B mishaps, and 28 of the 39 Class C mishaps. The number of flying hours decreased 26 percent.

The Class A mishap occurred in September and claimed the lives of all four crewmembers. It was the Lancer's first Class A since FY93.

The Class B mishaps included a failed nose landing gear (NLG) tire, bird strike, and static discharges. The NLG failed (exploded) shortly after takeoff and resulted in the NLG doors departing the aircraft and FOD to two engines. The bird strike also occurred shortly after takeoff when an unscheduled rendezvous with Canadian geese took place on a visual downwind. Two engines were damaged, and maintenance troops discovered a hole on the right side of the fuselage. The third Class B occurred overseas during a two-ship departure in the weather en route to low-level training and bombing activities. Within approximately 1 minute, both aircraft experienced static discharges. One aircraft received damage to the nose radome, an antenna, the right stabilizer, and an Electronic Countermeasures (ECM) transmitter. The other aircraft landed with a damaged aft radome and left stabilizer.

FOD-related incidents (12), bird strikes (7), and cracked windshields (3) accounted for the majority of the Class C mishaps. There were two physiological incidents, and FSOs were challenged by two instances where frozen brakes resulted in blown tires on landing.

B-2

Eight years running—no Class A or Class B mishaps. Victory! There were four Class C mishaps, down from six a year ago. Only one bird strike (four in FY96) and NO lightning strikes. Life is good! The evil side of Mother Nature this year was ice. The Class C mishaps included two ice FOD incidents causing engine damage. The remaining two mishaps involved, yes—the bird strike and a subtle boom strike during air refueling which maintenance personnel discovered during post-mission inspections. Flying hours were lower by 33 percent this year. All in all, another great year for the Stealth bomber. Oh, stay out of the rain.

B-52

The Buff continues to age gracefully. No Class A or Class B mishaps, but like the Lancers, a noticeable increase in Class Cs (four in FY96 to eight in FY97). Bird strikes accounted for half the Class C mishaps, just like last year. The remaining mishaps included a dual engine flameout, dropped object (aircraft parts—access door/panel), and a slow-speed, no damage slide into the overrun while attempting to turn off the runway at the departure end. NOTE: The B-52 community also logged less flying hours in FY97 (by 16 percent), but managed to steal the lead in total flying hours flown for the fiscal year from the B-1 folks.

Overall

I'd like to say it was a good year for the bomber community, but we lost the Lancer and its crew. Statistically, one Class A mishap is okay and only three Class Bs acceptable. The increase in Class C mishaps was duly noted. Some areas of special note this year were bird strikes and FOD incidents. Bird strikes accounted for approximately 27 percent of the Class B and C mishaps and FOD for almost 30 percent. The unwanted and unexpected "contacts" with the birds occurred day and night, in the traffic pattern, during low level, and at times unknown. Many types of birds appear to be increasing in large numbers, especially the Canadian geese. In fact, many never return to Canada and are content to hang out at golf course ponds, near runways, etc. Be ever vigilant, and if you need assistance, call the experts on our BASH team. The FOD problems occurred during ground operations with intent for flight and while airborne as the result of ingesting ice or aircraft parts.

Ironically, the Lancers' lifetime Class A mishap rate dropped to approximately 3.88 percent. The Class B rate jumps slightly to 5.28 percent. The B-2 logs zero Class A and Class B mishaps for the eighth year in a row. The B-52 is approaching 7.5 million flying hours, and its Class A and B mishap rates hang around 1.31 and 2.20 respectively. The Safety Center has data on the Buff dating back 43 years. It's not getting older—it's getting better! Before I forget, your B-1 and B-52 point of contact at the Safety Center is now Maj (S) Pat Kostrzewa (cuh-strew-uh), DSN 246-4099. Take care and fly safe!

Reporting Mishaps

With reduced manning and increased workload, there is a survival instinct that kicks in and pushes individuals (e.g., safety personnel) to find ways of lightening the load. I wrote this section of the article to convince flight safety personnel not to sacrifice timely and thorough mishap reporting in the interest of reducing the load.

The Air Force has several Major Weapons Systems (MWS) that perform unique missions or are comprised of a single wing. In such cases, there could be a tendency to underreport or avoid reporting incidents that have no apparent usefulness to MWS communities outside their own. Wrong answer! Aircraft always have components or technologies common to other aircraft systems. Even state-of-the-art aircraft. In addition, lessons learned can be gleaned from mishap narratives involving "other" aircraft.

The Safety Center is constantly asked to expand the distribution list for mishap reports. Why? Because fliers, maintainers, logistics center personnel, program offices, etc., learn from well-documented mishap reporting. The database at the Safety Center can be only as good as the data submitted for entry. Is the database used? Absolutely! Calls from individual units come in daily. In many instances, wing FSOs are preparing safety briefings for unit members. In one case, an FSO reviewed lessons learned from a Class A mishap involving student flight training conducted off-station due to runway construction at the home drome. His wing was in the process of moving aircraft, instructors, and students to another base in another state to conduct initial and upgrade training for a period of several weeks. Smart move! Why repeat the mistakes of the past (sounds like ORM)? Students in the FSO course and Aircraft Mishap Investigation Course (AMIC) taught at the Safety Center access the data as well.

USAF Photo by MSgt Perry J. Heimer

We used the database last fall to answer a Department of Defense tasker requesting recommendations for the improvement of military aviation safety. The briefing to the Defense Science Board for Aviation Safety, chaired by Gen Randolph (USAF, Retired), former commander of AF Systems Command, laid out recommendations for improving USAF flight safety and reducing the loss of money, equipment, and personnel associated with mishaps. Bottom line: Report mishaps *and incidents* in a timely and thorough manner. Knowledge is power! ✈

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C-5/C-17/C-141

MAJ ED CREECH
HQ AFSC/SEFF

Heavy transport aircraft flew 206,139 hours in FY97 routinely doing the things we do better than anyone else in the world: Airland, Air Refueling (AR), Airdrop, Prime Nuclear Airlift Force (PNAF), and Special Operations Low Level (SOLL) missions. Every day, our nation's constantly changing mobility requirements place our aircraft and crews in a variety of locations and situations from busy international airports to austere remote islands. The professionalism of our crews and maintenance specialists keeps the missions moving in a safe and timely manner. Despite our best efforts, we had one Class A flight mishap which resulted in nine fatalities and one Class A ground mishap (aircraft involvement) which resulted in one fatality.

C-5

The C-5 flew 57,735 hours in FY97 totaling 1,650,702 hours since it became operational in 1968. It had a good safety record for FY97 with zero Class A mishaps, zero Class B mishaps, 10 Class C mishaps, 2 HAPs, 1 physiological incident, and 4 FOD-related mishaps. Total cost: $2.7 million. Cumulative Class A mishap rate: 0.91.

The fleet encountered three birds during the year causing damage to the tune of $1.2 million. One large red-tailed hawk left a 1-foot hole in the left wing No. 5 slat. The pilot reported he noticed a flash go by the left side of the airplane but didn't hear or suspect a bird strike. At another time, a C-5 was scheduled to fly a routine local training mission. The bird condition was low for the airfield. The bird strike occurred during an initial touch-and-go when the aircraft encountered a flock of approximately 20 seagulls lifting off the runway at 6,000 feet remaining. All engines indicated normal, and the pilots continued the takeoff. Shortly after rotation, the crew noticed a strange smell along with vibrations from the No. 2 engine. The engine was shut down, an emergency was declared, and an uneventful three-engine landing was performed. Cost for this one alone: $600,000.

We had four instances of cargo leaks in the C-5. They included diesel fuel from a generator, paint thinner from dented 5-gallon drums, JP-8 from an H-60, and fuel from another generator. In the case of the paint thinner, the pallet holding the drums was downloaded from a C-141 the previous day after it had diverted when the crew discovered—you guessed it—paint thinner leaking from dented 5-gallon drums. When you smell fumes in the aircraft, assume they are toxic and don oxygen. Our C-5 crew did the right thing. Even JP-8 can affect your ability to perform. Just ask the lightheaded, stumbling loadmaster who cleaned up the H-60 fuel leak.

Now for the scary one. The factual evidence showed that the augmented crew was completing their mission for the day with over 20 hours on duty. ATC cleared the aircraft for a "pilot's discretion" descent from cruise altitude to proceed via own navigation to the IAF for an ILS approach to a remote island destination at night in IMC. At the IAF, the aircraft commander (AC) called for 40 percent flaps and landing gear extension. As the flaps

reached 40 percent, the crew noted a slat in-transit indication with no associated slat malfunction indications. Also, STALLIMITER 1 and 2 OFF annunciator lights illuminated.

The stallimiter system controls activation of the stick shaker and stall warning horn. As the aircraft entered IMC, the AC expected the aircraft to slowly descend and decelerate, but it began an unperceived shallow climb with airspeed decreasing at a rate of approximately 3 knots per second. Neither pilot nor the jump seat pilot noticed the aircraft's speed decreasing through the minimum required airspeed (141 KCAS) for their present 40 percent flap configuration.

As the airspeed decreased through 133 KCAS, the AC called for 100 percent flaps. The flap handle was not lowered to 100 percent, and no one in the cockpit recognized the improper configuration of the aircraft. The AC noticed the decreasing airspeed and increased power from idle to 75 percent. The aircraft stabilized at 120 KCAS in level flight with a 10-degree nose-up pitch attitude. This pitch attitude was appropriate for an aircraft flying at 100 percent flap speed when it was configured with 40 percent flaps. Altitude was 4,550 feet.

Concerned about the abnormally high pitch attitude, the pilot not flying (PNF) announced a possible INS attitude system malfunction. The AC acknowledged, but no one selected an alternate source of attitude information. The pilots relaxed pressure on the yoke, causing an increase in pitch attitude. Airspeed continued to decay and pitch attitude approached 20 degrees nose high. The AC decided to discontinue the approach, raised the landing gear, and increased power as pitch continued to increase. The aircraft began to stall. Initial stall buffet was felt but misidentified as turbulence. Remember, the stallimiter system was off. The PNF announced the need to increase power to Takeoff Rated Thrust (TRT) and reset the throttles.

The AC continued to hold nose-up elevator pressure as the airspeed rapidly bled off with pitch attitude remaining above 20 degrees. Heavy stall buffet was encountered and misidentified as wind shear. The PNF recognized and announced the need to lower the nose but failed to adequately convey the necessity to the AC. The aircraft departed controlled flight and rolled 95 degrees right, then 95 degrees left while up elevator control pressure was maintained.

Passing about 2,600 feet, the slat indication malfunction corrected itself, resulting in the activation of the stallimiter systems. The AC accomplished a stall recovery at 775 feet as the aircraft entered VMC. The aircraft lost about 4,000 feet in 45 seconds. This is about as close to a Class A mishap as you can get without actually being there.

C-17

The C-17 flew 23,274 hours in FY97 totaling 59,963 hours since it became operational in 1991. It had one Class A mishap, one Class B mishap, five Class C mishaps, five HAPs, and two FOD-related mishaps. Total cost: $1.8 million. FY97 Class A mishap rate: 4.30. Cumulative Class A mishap rate: 3.34. The aircraft also had one Class A ground mishap (aircraft involvement) which caused one fatality.

The Class A flight mishap occurred on the last planned Short Austere Airfield (SAAF) approach to an LZ. The pilot began a steep visual approach from approximately 2,000 feet AGL and selected a shorter than optimal aimpoint on the runway. The IP monitoring the approach made "power" calls to the pilot but was not forceful enough to ensure a proper approach angle and aimpoint and did not direct a go-around. The aircraft touched down 185 feet short of the runway. No injuries resulted from the mishap, but damage to the landing gear components drove the mishap into the Class A range.

One of our crews had the opportunity to practice some multiple simulator emergencies. Unfortunately they were in the real airplane. After an uneventful departure and climbout passing FL 210, a master caution light illuminated accompanied by multiple fuel boost pump-related indications of malfunctions. A minute later, smoke started emanating from the environmental control panel. Proper bold face procedures were performed for smoke in the aircraft. Shortly thereafter, the crew noted fire indications for the No. 3 engine and 10 seconds later for the No. 2 engine. The crew shut down both engines in accordance with bold face procedures, but all fire indications remained even after both fire bottles on each wing had been discharged. During holding prior to landing, the No. 1 engine fire detection loop switch light illuminated. After completing all checklists, the pilot landed the airplane and taxied clear of the runway. Damage to the right wing fillet area wire harness and environmental control panel cost $250,000 making this one a Class B. The crew did a good job handling these malfunctions to bring the airplane back safely.

One reported bird strike occurred during FY97 while the aircraft was on a low-level route. At 500 AGL and 300 KIAS, the copilot spotted a single large bird of prey at eye level and initiated a climb to avoid contact. As a result of the nose-up pitch of the aircraft and the bird's natural tendency to dive, the bird impacted the aircraft on the right nose gear door. The force of the impact drove the bird through the gear door and into the wheel well. The crew aborted the mission and returned home for repairs.

Let's take a look at the ground mishap. The AFI 51-503 report shows there were three pilots, three loadmasters, one flying crew chief, and a Navy SEAL jumpmaster on board the aircraft. The crew was on the second day of a 5-day High-Altitude Low-Opening (HALO) airdrop mission.

After the third sortie of the day, the crew landed the airplane and planned to perform an Engine Running On/Offload (ERO) to deplane the jumpmaster and enplane other jumpers for the last sortie. The jumpmaster had remained on the aircraft after the previous jump to observe the C-17's navigational capabilities from the flight deck. The engines were placed in reverse idle in ac-

continued on next page

cordance with ERO procedures, and the pilot cleared the loadmasters to open the cargo door and ramp, the planned entry route for the jumpers. The loadmasters were unable to open the cargo door and ramp due to an unperceived pressurization problem in the aircraft causing approximately 86,000 pounds of outward air pressure on the cargo door. The smaller crew entry door had approximately 3,200 pounds of pressure acting on it.

The AC left the pilot seat and attempted to open the crew entry door. When he encountered more resistance than he expected, he suspected a pressurization problem and turned off both air-conditioning packs. He went back to the crew entry door and attempted to open it. Even with the air-conditioning packs off, residual pressure remained inside the aircraft. The AC was able to lift the crew entry door latch handle to the unlatch position even with the differential pressure. The crew entry door opened explosively and ejected one of the other pilots and the Navy SEAL jumpmaster. They both fell to the parking ramp below. The pilot sustained minor injuries and the Navy SEAL jumpmaster sustained a fatal head injury.

C-141

The C-141 flew 125,130 hours in FY97, amassing 10,207,344 hours since its inception in 1964. Compared to the busy years (1991—442K hours and 1968—672K hours), 125K hours is quite a reduction. But the aircraft still flew over 60 percent of the heavy airlift hours. The C-141 experienced its first Class A mishap since November 1992, one Class B mishap, six Class C mishaps, two HAPs, and six FOD-related mishaps. Total cost: $15 million. Cumulative Class A mishap rate: 0.32.

The investigation into the Class A mishap has just begun, and details are pending. Nine crewmembers were aboard the Starlifter as it proceeded from Windhoek Airfield in Namibia to the Ascension Islands. News reports indicate wreckage from the mishap aircraft is being pulled from the south Atlantic off the coast of Namibia.

Bird strikes alone accounted for almost $800,000 in damage. Three events occurred and, as usual, they were close to the ground and/or in the vicinity of runways. One bird hit just above the windscreen and caused enough damage to allow air to leak into the cockpit area. The two other bird strikes trashed engines.

The Class B mishap occurred at a remote island location during takeoff roll. At approximately 110 KCAS, the No. 4 engine fifteenth stage compressor disk failed catastrophically and the crew performed a successful abort.

We had two tail scrapes this year. One occurred on a short, narrow runway at night with inadequate lighting. The pilot flew a stable PAR approach, but during the transition to visual cues allowed the aircraft to land long, hard, and slow. The second incident was potentially more serious. It happened during a local training sortie with multiple approaches, landings, and go-arounds. Early in the sortie, the IP did not properly intervene and allowed his trainee to continue a high sink rate dropped-in landing. The aircraft struts were compressed to the point where the underside of the aircraft aft of the main landing gear contacted the pavement, causing structural damage. Unaware that the aircraft came in contact with the runway, the aircrew continued the sortie to completion. Post-flight inspection revealed external damage to the right rear bottom panels and extensive internal damage to associated floor structures.

One mishap related to flight instrument failure occurred which, had it been in IMC, would have been a lot

Official USAF Photo

more exciting. After checking the minimum equipment list (MEL), requesting a waiver from TACC, and consulting with home station DOV, the crew departed for home station with an inoperative Attitude Heading Reference System (AHRS). Both Inertial Navigation Systems (INS) were functioning properly. The sortie was a depositioning leg with VFR weather forecast at both locations and en route. While cruising at FL 390, approximately 1 hour into the sortie, the No. 1 INS INOP annunciator light flickered and continued to do so for approximately 30 minutes. The pilot's ADI and HSI then began to tumble with the INS No. 1 INOP light steadily illuminated. Five minutes later, the INS No. 2 INOP light illuminated, and the copilot's ADI and HSI also began to tumble. With the AHRS inoperative, all primary gyro stabilized instruments were now tumbling at both pilot and copilot positions. The standby attitude indicator was working properly and providing accurate indications. While approaching home station, the crew was able to maintain visual contact with the ground. The pilot requested no-gyro vectors, remained in VMC, and completed a visual approach to an uneventful landing.

FOD accounted for almost $900,000 damage to the 141 fleet. Of the four FOD encounters (excluding bird strikes), two required an engine change due to extensive damage to the fan and compressor sections. In all four cases, the mishap reports read "crew did not notice any abnormal engine indications during flight."

A C-141 was due to depart a remote island location with 150 passengers, three baggage pallets, one cargo pallet, and 80,000 pounds of fuel. Two hours prior to departure, the four pallets, with a combined weight of over 20,000 pounds, were loaded on the aircraft in pallet positions 10 through 13 (the most aft positions). The flight crew arrived and began the preflight inspection. During the inspection, they discovered a fuel cell discrepancy and returned the aircraft to maintenance. Nine hours later, a three-man maintenance team arrived at the aircraft to prepare it for fuel cell in-tank maintenance. Forty-five minutes into the defueling operation, with only 1,000 pounds of fuel left in the tanks, the aircraft center of gravity limits were exceeded, and the aircraft settled aft onto the cargo ramp and pedal doors. The maintenance team, determining that the two-point rotate attitude without airspeed was inappropriate, regained the center of gravity by having three 185-pound people walk from the rear to the nose of the 175,000-pound aircraft. The aircraft settled back on its nose with no damage.

Recap

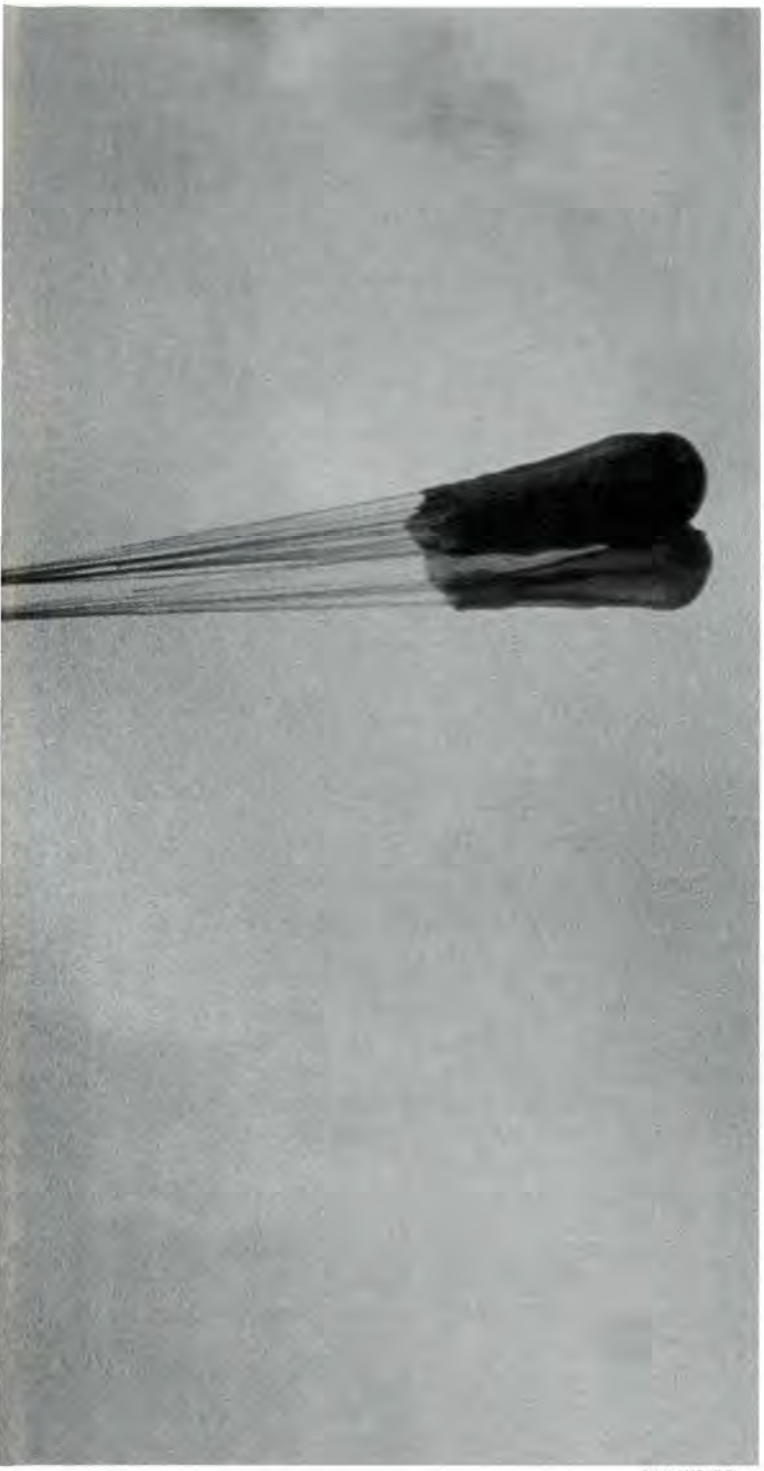
Words that should illuminate in your mind after reading about these mishaps are words I'm sure you're very familiar with if you've been involved with these aircraft for any length of time at all. You have to read between the lines to see them, but they're there in bold print: **knowledge of tech orders, spatial disorientation, task saturation, distraction, inadequate instrument cross-check, fatigue, failure to communicate.**

CRM...we preach about it every year because most of our preventable mishaps are caused by a lack of it. Being on a crew airplane is like being married. In both situations, if you have a failure to communicate, you're going to have problems. Intimidation brought about by rank, experience, personality, and position does not enhance communication. Everyone on the airplane needs to feel they are an integral part of the crew. They need to know their inputs are important. With an attitude like that, the life you save may be your own. ✈

C-130

MAJ ROGER WILLIAMS JR.
HQ AFSC/SEFF

As the new C-130 guy in the Safety Center, we'll separate the old Herk out from Maj Ed Creech's "T-tail" section. It's hard to believe the Herk has been in operation since 1955 and is ***still*** in production. Over 2,100 C-130s have been produced to date. This multirole aircraft is used in tactical airlift, search and rescue, special operations, as a gunship, and as an electronic warfare platform. No other aircraft is as mul-



Official USAF Photo

titalented as the Herk. This global workhorse has accumulated over 14 million flying hours in the USAF and over 24 million worldwide. In FY97, over 276,000 hours were flown in the USAF.

We had two distressing Class A's this past year with 13 fatalities, one in the Pacific Ocean and the other off the end of a runway in Honduras. FY92 was the last year we had two Class A's. The last year we didn't have any Class A's was in FY90. As a result of the recent C-130 mishaps, a Broad Area Review Board, appointed by SECAF, was formed to ensure the safety of the entire C-130 fleet.

According to the Releasable AFI 51-503 Accident Reports

An HC-130 had four-engine power loss over the Pacific Ocean and is still undergoing investigation—more to follow.

The second mishap, the Honduras C-130 mishap, was **avoidable.** The aircraft landed long at Toncontin IAP, Tegucigalpa, Honduras, touching down approximately 2,000 feet past the displaced threshold, with 50 percent flaps, leaving approximately 3,000 feet of runway remaining at a *higher*-than-normal landing speed. The required landing distance for 50 percent flaps (using the criteria in MCR 55-130, Vol 1, para 5.20.3) is 6,250 feet. The landing distance for a 100 percent flap landing is calculated to be 5,000 feet. The runway available for this landing, considering the displaced threshold, is 5,437 feet. The aircraft went off the end of the runway and fell 50 feet where it was destroyed in post-mishap fire. In the statement of opinion by the AFI 51-503 legal board, the crew landed the aircraft long and at a faster-than-normal touch-down speed.

One Class B occurred this year and was due to oil contamination of the engine power section. One hour into a training sortie, the crew noticed low engine oil pressure on the No. 1 engine. After applying the Engine Shutdown Procedure, the engine continued to leak oil. The aircraft recovered with no further problems.

The C-130 community had 26 Class C mishaps reported this year, down from last year's 36. Four different instances of bird strikes caused $151,562 of damage to aircraft airframes. These bird strikes occurred at 1,000 feet AGL and below. Lightning strikes were responsible for damage to three different aircraft. There were two different cases of gravel damage to the bottom of aircraft due to landing on unprepared surfaces. Cost of gravel damage—$275,787. One Class C involved damage to the skid plate and sub-floor—$117,476. We also had two aircraft depart the runway surface (two runway departures in FY96). One aircraft departed the hard-packed surface while doing a 180 at the end of the runway and sank the right main landing gear into the sand. The wing angle of the aircraft as it went off the runway caused a prop to hit the ground. The second aircraft departed the end of an LZ doing damage to the main landing gear. Luckily, it was flat terrain. There were 10 reported cases of FOD for FY97 with no trends noted.

In summary, FY97 was not a banner year for the workhorse of the "heavies," especially when mishaps can be avoided. Two aircraft destroyed and over $36 million of damage. Overall Class A mishap rate for FY97 is 0.73 which is below the lifetime rate of 0.99. Last year's Class A mishap rate was 0.34. What was the worst year, you ask? In 1966, the C-130 community experienced 16 Class A's with 6 destroyed aircraft, followed closely by 1967 with 13 Class A's and 9 destroyed aircraft. We've come a long way, but there is always room for improvement.✈

C-135

Official USAF Photo by TSgt Marvin Lynchard

MAJ LEE ALEXANDER
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The -135 community had a pretty interesting year in FY97. That's not good! Safety officers like dull, boring years. Before we get into any details, let's go over the numbers for the last 2 years.

The -135 fleet flew 216,500 hours last year and experienced no Class A mishaps. That means the Class A rate should be just about zero. The FY96 numbers were 215,105 flying hours and zero Class A mishaps. The chart below gives the breakdown for all reportable mishaps for fiscal years '96 and '97.

	Class A	Class B	Class C	HAP	Physiological	Other	Total
FY97	0	3	24	8	4	4	43
FY96	0	0	26	9	5	7	47

Immediately obvious from this chart are the three Class B mishaps in FY97. Less obvious, but still important, is the nature of a few of the Class C mishaps this year. I'll summarize the Class B's first, then cover a few of the more interesting Class C's.

Class B Mishaps

Birds...Again!

The crew was departing from an East Coast Naval Air Station on a cargo mission. Prior to takeoff, the tower warned the crew of bird activity in the infield near the runway. The crew acknowledged the warning and, after a short wait, began their takeoff. Shortly after takeoff, at about 2,000 feet AGL and 4 miles from the field, out of the corner of his eye the pilot saw some birds approaching the left side of the aircraft. The sky was very hazy, making it difficult to spot the birds in time to react. The aircraft had also just cleaned up, making aggressive maneuvering impossible. Several snow geese impacted the left side of the aircraft causing a catastrophic uncontained failure of the No. 2 engine fan section and the loss of left-side hydraulics. Pieces of the shattered No. 2 engine penetrated the No. 1 engine causing severe damage.

This crew made some quick "heads up" decisions. They shut down the No. 2 engine, began dumping fuel, and ran the checklist for left-side hydraulics loss. The aircraft commander decided to land at an appropriate airfield off the nose of the aircraft rather than try to return to the departure field. The story has a happy ending (unless you're a snow goose) with the aircraft safely recovering on three engines. Although the No. 1 engine was operating for landing, postflight inspection showed it to be damaged beyond economical repair. It probably wouldn't have run much longer.

Lessons learned from this mishap are:

1. FAR regulations only require controllers to give you information on bird activity on the airfield, not the departure and arrival corridor. You may get this information from Air Force controllers, but not from other agencies.

2. You may need to dig through several publications (AP-1B, IFR supp, local guides) to get complete infor-

mation on bird activity at an unfamiliar airfield.

3. If you're flying at a low or medium altitude along a known migratory bird route *during* the migration season—watch out!

Hard Landing

This crew was on the ILS for a full-stop landing after a 2-hour trip. Although they got a weather update for their destination, they didn't plan well enough for the tailwind they experienced on approach. The mishap pilot (MP) intercepted the glide slope but began to get low. After the decision height, the MP was still low and shifted his aim point to the threshold of the runway. At about 50 feet AGL, the MP rapidly retarded the throttles to idle. The mishap aircraft (MA) crossed the threshold a little over 5 feet AGL and landed hard in the overrun about 250 feet short of the runway threshold. The MA bounced approximately 40 feet high and came back down to the runway nose first. The nose gear sheared off, and leaking hydraulic fluid started a small fire. The MA slid about 1,000 feet down the runway, the crew egressed normally, and the fire department extinguished the fire.

Whew! Where do I start? It's easy to start with "Hang the guilty ****!" But it's nowhere near that simple. This guy isn't the first pilot to drop below glide slope and aim short. Where was the rest of the crew? What about all this CRM stuff? We are still teaching it, aren't we? There were multiple opportunities for the crew to help out the MP, both during the approach and right up to the rather dramatic bounce. The last crew I was on had an agreement. Anyone on the flight deck could call "go around"—once, anyway. We could discuss the reasons on downwind for the next approach. I can't imagine riding through this approach and landing without making some very directed comments—some very *loud* directed comments! This pilot made some mistakes, but his crew let him down.

Engine Failure/Fire

The mishap aircraft was completing a taxi-back landing. When the throttles were placed in reverse thrust, the No. 4 engine failed catastrophically and caught fire. The aircraft was stopped on the runway, the crew egressed uneventfully, and the fire was quickly extinguished.

This mishap is still under investigation, and any conclusions right now would be premature. We'll cover this in more depth in next year's issue.

Class C Mishaps

I always find it enlightening to review a year's worth of these "minor" mishaps. Class C mishaps have always been one of the best indicators of where the next major mishap may occur. Here's what I see from this year's Class C mishaps:

Air Refueling

There were four air refueling mishaps in FY97 compared to five last year. The total damage was less this year, but that's probably due more to circumstance than any crew actions or preventive measures.

Bird Strikes

There were four bird strikes in both FY96 and FY97. We also had a "large hare" strike this year that sort of falls into this category. The number of bird strikes isn't surprising, but the damage cost was much greater this year. This was mainly due to when the bird strikes occurred and how the crew reacted. I'll cover more on this later.

Flight Controls

The -135 fleet experienced seven flight control malfunctions in FY97. That's nearly a third of the total Class C mishaps reported this year. The causes ranged from control binding due to improper snow and ice removal, autopilot malfunctions, and pitch and yaw transients with no determined causes. There were five mishaps of this type reported in FY96. Several of these also had unknown causes. Flight control mishaps caused more damage in FY97 than FY96 due mostly to when they occurred. Three occurred during takeoff and one during landing, which brings me to my next point.

Official USAF Photo

High-Speed Aborts

Six mishaps in FY97 ended in high-speed (above 100 kts) abort situations. Three aborts were initiated above computed S1 speed, and the *average* speed of these six aborts was 134 knots! Needless to say, there were lots of brake, tire, and wheel changes in FY97. Three of these

continued on next page

mishaps had pilot cause factors dealing with the abort decision and actions taken after the abort.

I'd like to summarize two FY97 Class C mishaps that particularly got my attention. They are good examples of what I see as possible trends within the -135 community.

Uncommanded Early Rotation

During the takeoff roll of an operational refueling mission, the mishap aircraft's nose wheel began to lift off the runway at about 120 knots. Planned rotation speed was 165 knots. The copilot, who was performing the takeoff, attempted to lower the nose with full forward yoke, but the nose continued to rise. At this time, the aircraft commander (AC) took control of the aircraft and initiated abort procedures. As the throttles were pulled to idle, the nose began to settle to the runway, and max brakes and full-speed brakes were applied. As the end of the runway came up, the AC wasn't sure the aircraft would remain on the prepared surface. He applied nose wheel steering in an attempt to "ground loop" the aircraft in accordance with Dash One procedures. The aircraft came to rest 24 feet from the end of the overrun, and the crew and passengers egressed normally.

Postflight inspections revealed this crew had ridden through the Mother of All Wheelies, with the boom and aft fuselage scraping the runway for about 45 feet. The elevator trim was also found in the full-up position. Here are a few things the investigation discovered:

1. The trim was in the takeoff position prior to beginning the takeoff roll.
2. Neither pilot activated the trim during takeoff roll.
3. An untrained observer saw the trim wheel slowly rotating aft during the takeoff.
4. The stab trim was stopped by the electrical cutoff switch at the motor.

Needless to say, this mishap got a lot of attention. If the nose wheel had lifted off at a slightly higher airspeed, the aircraft would have become airborne, and the results could have been catastrophic. By all rights, this jet should have been in the dirt as it was. The crew deserves big kudos.

This mishap was briefed at the KC-135 System Safety Group, and the right people are working the problem. However, if I were flying tanks right now, I'd keep a close eye on that trim wheel.

Bird Condition Moderate

This mishap aircraft was on takeoff roll with a decision speed (S1) of 130 knots and a refusal speed of 146 knots. Shortly after S1, the crewmembers saw a bird pass under the nose and heard an impact sound. The AC took control of the aircraft from the copilot, pulled the throttles to idle, and initiated an abort. He then momentarily pushed the throttles back up, then again retarded them and completed the abort sequence. Max braking was applied at 150 knots. The aircraft stopped on the remaining runway, taxied clear, and all crewmembers egressed the aircraft. Two birds did impact the aircraft, but the engines were operating normally.

This isn't the only incident of this type we experienced in FY97, but it's a good example. The Air Force got out of this one cheap with eight tires, wheels, and brakes, but the story could have had a much different ending. For those of you who didn't read last year's article, pick up a copy of the December/January issue of *Flying Safety* magazine and turn to the photo of the E-3 lying in the water with the fuselage broken. They aborted above refusal speed too, but they didn't stay on the runway.

There are a lot of good reasons to abort a takeoff, but the list gets shorter for every knot of speed the aircraft gains. Above decision speed, that list is *very short*. Very few decisions in heavy aircraft need to be made as quickly as the abort decision. The only way to have any hope of making the right decision is to make it before you start the takeoff. You should practice every conceivable abort scenario in the simulator. Your crew should be briefed on what you expect for every takeoff. If the conditions change, then the brief should change, too.

I know you can't prepare for every scenario. Making decisions when the checklist runs out is the main reason we have humans in the cockpit. However, most things that go wrong in airplanes have happened before, and there is no excuse for not being prepared.

Wrap-Up

Some people here at the Safety Center will make predictions on where our next mishap will occur. I hesitate to do that because I fear success. I guess in a way this entire article is a prediction because what I've written about are the problems I see in the -135 community. To someone who has flown heavy aircraft for 15 years, this may seem like a rehash of old news. It does to me, frankly. But the fact is, this isn't old news. It's happening right now, and it will continue in the future. And, of course, there aren't as many people around who have been flying for 15 years. The cheapest way to learn lessons, especially hard lessons, is to borrow them from someone else. ✈

Statistics...C-10 & C-21

C-10 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY81	0	0.00	0	0.00	0	0.00	0	0	2,054	2,054
CY82	0	0.00	0	0.00	0	0.00	0	0	7,018	9,072
CY83	0	0.00	0	0.00	0	0.00	0	0	12,831	21,903
CY84	0	0.00	1	5.12	0	0.00	0	0	19,534	41,437
CY85	0	0.00	0	0.00	0	0.00	0	0	24,617	66,054
CY86	0	0.00	0	0.00	0	0.00	0	0	32,572	98,626
TY87	0	0.00	2	6.68	0	0.00	0	0	29,952	128,578
FY88	0	0.00	0	0.00	0	0.00	0	0	43,558	172,136
FY89	0	0.00	0	0.00	0	0.00	0	0	47,350	219,486
FY90	0	0.00	0	0.00	0	0.00	0	0	51,490	270,976
FY91	1	1.46	1	1.46	0	0.00	0	0	68,668	339,644
FY92	1	2.31	1	2.31	0	0.00	0	0	43,253	382,897
FY93	0	0.00	0	0.00	0	0.00	0	0	54,266	437,163
FY94	0	0.00	0	0.00	0	0.00	0	0	52,289	489,452
FY95	0	0.00	0	0.00	0	0.00	0	0	43,381	532,833
FY96	2	3.87	0	0.00	0	0.00	0	0	51,725	584,558
FY97	0	0.00	0	0.00	0	0.00	0	0	50,821	635,379
LIFETIME	4	0.63	5	0.79	0	0.00	0	0	635,379	
5 YR AVG	0.4	0.79	0.0	0.00	0.0	0.00	0.0	0.0	50,496.4	
10 YR AVG	0.4	0.79	0.2	0.39	0.0	0.00	0.0	0.0	50,680.1	

C-21 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY84	0	0.00	0	0.00	0	0.00	0	0	9,478	9,478
CY85	0	0.00	0	0.00	0	0.00	0	0	44,555	54,033
CY86	0	0.00	0	0.00	0	0.00	0	0	54,134	108,167
TY87	1	2.32	0	0.00	1	2.32	2	2	43,145	151,312
FY88	0	0.00	0	0.00	0	0.00	0	0	56,076	207,388
FY89	0	0.00	0	0.00	0	0.00	0	0	59,607	266,995
FY90	0	0.00	0	0.00	0	0.00	0	0	54,535	321,530
FY91	0	0.00	0	0.00	0	0.00	0	0	54,923	376,453
FY92	0	0.00	0	0.00	0	0.00	0	0	47,603	424,056
FY93	0	0.00	0	0.00	0	0.00	0	0	48,421	472,477
FY94	0	0.00	0	0.00	0	0.00	0	0	47,336	519,813
FY95	1	2.13	0	0.00	1	2.13	2	7	47,020	566,833
FY96	0	0.00	0	0.00	0	0.00	0	0	46,239	613,072
FY97	0	0.00	0	0.00	0	0.00	0	0	44,748	657,820
LIFETIME	2	0.30	0	0.00	2	0.30	4	9	657,820	
5 YR AVG	0.2	0.43	0.0	0.00	0.2	0.43	0.4	1.4	46,752.8	
10 YR AVG	0.1	0.20	0.0	0.00	0.1	0.20	0.2	0.7	50,650.8	

Statistics...C-130

C-130 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY55	1	2173.91	0	0.00	0	0.00	0	0	46	46
CY56	1	186.22	0	0.00	0	0.00	0	0	537	583
CY57	0	0.00	0	0.00	0	0.00	0	0	22,633	23,216
CY58	4	5.04	1	1.26	1	1.26	2	6	79,290	102,506
CY59	4	3.98	1	1.00	1	1.00	1	10	100,457	202,963
CY60	1	0.82	0	0.00	0	0.00	0	0	121,844	324,807
CY61	4	2.79	0	0.00	1	0.70	0	0	143,363	468,170
CY62	6	3.42	6	3.42	3	1.71	8	33	175,479	643,649
CY63	2	0.79	3	1.18	1	0.39	0	0	254,331	897,980
CY64	4	0.94	3	0.71	1	0.24	0	1	424,034	1,322,014
CY65	9	1.62	6	1.08	5	0.90	9	25	554,079	1,876,093
CY66	16	2.20	11	1.51	6	0.83	8	23	727,191	2,603,284
CY67	13	1.98	12	1.83	9	1.37	5	78	656,986	3,260,270
CY68	11	1.85	6	1.01	6	1.01	0	8	593,976	3,854,246
CY69	8	1.49	7	1.30	4	0.74	9	35	537,126	4,391,372
CY70	3	0.60	4	0.79	3	0.60	8	60	504,113	4,895,485
CY71	2	0.41	5	1.03	1	0.21	3	10	487,137	5,382,622
CY72	7	1.46	4	0.83	5	1.04	12	29	480,989	5,863,611
CY73	1	0.25	4	1.00	1	0.25	3	7	399,605	6,263,216
CY74	5	1.39	3	0.83	3	0.83	4	12	360,549	6,623,765
CY75	3	0.82	1	0.27	2	0.55	3	8	365,181	6,988,946
CY76	0	0.00	1	0.30	0	0.00	0	0	336,592	7,325,538
CY77	1	0.30	12	3.59	0	0.00	0	1	334,524	7,660,062
CY78	7	2.01	37	10.63	5	1.44	11	29	348,168	8,008,230
CY79	0	0.00	1	0.28	0	0.00	0	0	360,806	8,369,036
CY80	2	0.56	0	0.00	2	0.56	4	22	354,589	8,723,625
CY81	4	1.09	2	0.54	3	0.81	4	39	368,433	9,092,058
CY82	2	0.53	1	0.27	2	0.53	8	34	376,261	9,468,319
CY83	1	0.27	1	0.27	1	0.27	2	6	376,939	9,845,258
CY84	3	0.80	1	0.27	1	0.27	3	18	374,577	10,219,835
CY85	3	0.79	2	0.52	3	0.79	5	27	381,929	10,601,764
CY86	2	0.54	0	0.00	2	0.54	3	14	367,186	10,968,950
TY87	1	0.36	3	1.09	1	0.36	1	5	274,706	11,243,656
FY88	2	0.58	0	0.00	1	0.29	2	6	344,160	11,587,816
FY89	1	0.29	0	0.00	1	0.29	0	1	339,149	11,926,965
FY90	0	0.00	0	0.00	0	0.00	0	0	325,201	12,252,166
FY91	0	0.00	0	0.00	0	0.00	0	0	401,615	12,653,781
FY92	2	0.63	0	0.00	2	0.63	8	24	315,952	12,969,733
FY93	1	0.33	0	0.00	1	0.33	2	6	300,157	13,269,890
FY94	1	0.36	1	0.36	1	0.36	0	8	279,923	13,549,813
FY95	1	0.35	1	0.35	1	0.35	2	6	282,864	13,832,677
FY96	1	0.34	1	0.34	1	0.34	2	9	294,075	14,126,752
FY97	2	0.73	1	0.36	2	0.73	2	13	275,756	14,402,508
LIFETIME	142	0.99	142	0.99	83	0.58	134	613	14,402,508	
5 YR AVG	1.2	0.42	0.8	0.28	1.2	0.42	1.6	8.4	286,555.0	
10 YR AVG	1.1	0.35	0.4	0.13	1.0	0.32	1.8	7.3	315,885.2	

Statistics...C-12 & C-17

C-12 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY75	0	0.00	0	0.00	0	0.00	0	0	435	435
CY76	0	0.00	0	0.00	0	0.00	0	0	3,146	3,581
CY77	0	0.00	0	0.00	0	0.00	0	0	7,017	10,598
CY78	0	0.00	0	0.00	0	0.00	0	0	6,651	17,249
CY79	1	23.36	1	23.36	1	23.36	2	5	4,280	21,529
CY80	0	0.00	0	0.00	0	0.00	0	0	4,484	26,013
CY81	0	0.00	0	0.00	0	0.00	0	0	5,978	31,991
CY82	0	0.00	0	0.00	0	0.00	0	0	6,094	38,085
CY83	0	0.00	0	0.00	0	0.00	0	0	3,665	41,750
CY84	1	11.05	0	0.00	0	0.00	0	1	9,046	50,796
CY85	0	0.00	0	0.00	0	0.00	0	0	29,222	80,018
CY86	0	0.00	0	0.00	0	0.00	0	0	33,674	113,692
TY87	0	0.00	0	0.00	0	0.00	0	0	25,413	139,105
FY88	0	0.00	0	0.00	0	0.00	0	0	33,018	172,123
FY89	0	0.00	0	0.00	0	0.00	0	0	37,707	209,830
FY90	0	0.00	0	0.00	0	0.00	0	0	34,928	244,758
FY91	0	0.00	0	0.00	0	0.00	0	0	34,944	279,702
FY92	0	0.00	0	0.00	0	0.00	0	0	28,893	308,595
FY93	0	0.00	0	0.00	0	0.00	0	0	27,099	335,694
FY94	0	0.00	0	0.00	0	0.00	0	0	16,500	352,194
FY95	0	0.00	0	0.00	0	0.00	0	0	21,461	373,655
FY96	0	0.00	0	0.00	0	0.00	0	0	4,740	378,395
FY97	0	0.00	0	0.00	0	0.00	0	0	5,175	383,570
LIFETIME	2	0.52	1	0.26	1	0.26	2	6	383,570	
5 YR AVG	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.0	14,995.0	
10 YR AVG	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.0	24,446.5	

C-17 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
FY91	0	0.00	0	0.00	0	0.00	0	0	8	8
FY92	0	0.00	0	0.00	0	0.00	0	0	539	547
FY93	0	0.00	0	0.00	0	0.00	0	0	1,252	1,799
FY94	0	0.00	0	0.00	0	0.00	0	0	4,454	6,253
FY95	0	0.00	0	0.00	0	0.00	0	0	12,968	19,221
FY96	1	4.75	1	4.75	0	0.00	0	0	21,050	40,271
FY97	1	4.28	1	4.28	0	0.00	0	0	23,389	63,660
LIFETIME	2	3.14	2	3.14	0	0.00	0	0	63,660	
5 YR AVG	0.4	3.17	0.4	3.17	0.0	0.00	0.0	0.0	12,622.6	

Statistics...C-141

C-141 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	ALL	HOURS	CUM HRS
CY64	0	0.00	0	0.00	0	0.00	0	0	2,469	2,469
CY65	0	0.00	0	0.00	0	0.00	0	0	35,316	37,785
CY66	1	0.53	0	0.00	0	0.00	0	0	189,246	227,031
CY67	4	0.87	1	0.22	2	0.43	3	12	461,704	688,735
CY68	0	0.00	4	0.59	0	0.00	0	0	672,627	1,361,362
CY69	0	0.00	1	0.16	0	0.00	0	0	642,291	2,003,653
CY70	1	0.16	2	0.33	0	0.00	0	0	612,518	2,616,171
CY71	1	0.20	0	0.00	0	0.00	0	0	487,929	3,104,100
CY72	0	0.00	2	0.42	0	0.00	0	0	471,440	3,575,540
CY73	2	0.55	0	0.00	1	0.28	3	24	362,532	3,938,072
CY74	2	0.70	0	0.00	1	0.35	3	7	286,377	4,224,449
CY75	4	1.27	0	0.00	1	0.32	3	16	314,771	4,539,220
CY76	3	1.07	2	0.71	2	0.71	7	41	281,622	4,820,842
CY77	2	0.67	5	1.67	0	0.00	0	0	299,191	5,120,033
CY78	1	0.35	4	1.42	0	0.00	0	0	282,594	5,402,627
CY79	3	1.03	4	1.37	1	0.34	0	0	291,223	5,693,850
CY80	1	0.36	0	0.00	1	0.36	2	13	281,411	5,975,261
CY81	1	0.34	1	0.34	0	0.00	0	0	290,389	6,265,650
CY82	1	0.35	0	0.00	1	0.35	2	9	284,675	6,550,325
CY83	0	0.00	2	0.68	0	0.00	0	0	294,531	6,844,856
CY84	1	0.35	0	0.00	1	0.35	3	9	286,443	7,131,299
CY85	0	0.00	0	0.00	0	0.00	0	0	293,380	7,424,679
CY86	1	0.35	0	0.00	0	0.00	0	0	288,339	7,713,018
TY87	1	0.45	0	0.00	0	0.00	0	0	220,161	7,933,179
FY88	0	0.00	0	0.00	0	0.00	0	0	264,201	8,197,380
FY89	1	0.36	0	0.00	1	0.36	2	8	276,770	8,474,150
FY90	0	0.00	0	0.00	0	0.00	0	0	304,106	8,778,256
FY91	0	0.00	0	0.00	0	0.00	0	0	442,406	9,220,662
FY92	0	0.00	0	0.00	0	0.00	0	0	226,312	9,446,974
FY93	1	0.49	0	0.00	2	0.98	4	13	203,264	9,650,238
FY94	0	0.00	0	0.00	1	0.78	0	0	127,938	9,778,176
FY95	0	0.00	0	0.00	0	0.00	0	0	157,059	9,935,235
FY96	0	0.00	0	0.00	0	0.00	0	0	146,417	10,081,652
FY97	1	0.82	1	0.82	1	0.82	2	9	122,137	10,203,789
LIFETIME	33	0.32	29	0.28	16	0.16	34	161	10,203,789	
5 YR AVG	0.4	0.26	0.2	0.18	0.8	0.53	1.2	4.4	151,363.0	
10 YR AVG	0.3	0.13	0.1	0.04	0.5	0.22	0.8	3.0	227,061.0	

Statistics...C-135

C-135 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	ALL	HOURS	CUM HRS
CY57	0	0.00	0	0.00	0	0.00	0	0	4,497	4,497
CY58	3	6.94	2	4.63	2	4.63	7	20	43,204	47,701
CY59	3	2.53	1	0.84	2	1.69	4	8	118,426	166,127
CY60	3	1.94	2	1.29	5	3.23	3	9	154,579	320,706
CY61	2	0.99	0	0.00	0	0.00	0	0	201,263	521,969
CY62	5	1.78	5	1.78	5	1.78	13	60	280,695	802,664
CY63	3	0.89	0	0.00	4	1.19	7	21	336,771	1,139,435
CY64	1	0.26	2	0.52	2	0.52	2	83	385,681	1,525,116
CY65	4	1.00	0	0.00	5	1.25	11	126	400,572	1,925,688
CY66	2	0.44	1	0.22	3	0.67	6	21	449,445	2,375,133
CY67	2	0.48	3	0.71	2	0.48	4	10	419,651	2,794,784
CY68	6	1.19	2	0.40	5	1.00	15	43	502,467	3,297,251
CY69	5	1.16	3	0.69	4	0.93	4	23	431,849	3,729,100
CY70	1	0.27	1	0.27	0	0.00	0	0	376,930	4,106,030
CY71	2	0.54	1	0.27	2	0.54	7	29	372,410	4,478,440
CY72	4	0.91	3	0.68	1	0.23	3	5	438,029	4,916,469
CY73	4	1.21	1	0.30	1	0.30	2	3	329,410	5,245,879
CY74	2	0.67	2	0.67	1	0.34	1	2	296,320	5,542,199
CY75	1	0.38	3	1.13	1	0.38	2	4	266,522	5,808,721
CY76	2	0.77	0	0.00	2	0.77	11	22	259,785	6,068,506
CY77	2	0.76	33	12.58	2	0.76	2	20	262,304	6,330,810
CY78	0	0.00	34	12.51	0	0.00	0	0	271,819	6,602,629
CY79	3	1.11	6	2.23	1	0.37	3	5	269,432	6,872,061
CY80	1	0.39	2	0.78	0	0.00	0	0	256,761	7,128,822
CY81	3	1.16	2	0.77	2	0.77	3	27	259,602	7,388,424
CY82	2	0.77	0	0.00	2	0.77	6	33	260,007	7,648,431
CY83	0	0.00	0	0.00	0	0.00	0	0	258,777	7,907,208
CY84	0	0.00	3	1.15	0	0.00	0	0	261,112	8,168,320
CY85	2	0.77	0	0.00	2	0.77	5	10	260,908	8,429,228
CY86	1	0.39	0	0.00	1	0.39	2	4	256,743	8,685,971
TY87	2	1.02	0	0.00	2	1.02	3	7	196,423	8,882,394
FY88	0	0.00	1	0.39	0	0.00	0	0	254,973	9,137,367
FY89	3	1.14	1	0.38	2	0.76	4	26	263,910	9,401,277
FY90	1	0.37	0	0.00	1	0.37	2	4	270,624	9,671,901
FY91	1	0.34	0	0.00	0	0.00	0	0	298,070	9,969,971
FY92	1	0.39	0	0.00	1	0.39	0	0	255,073	10,225,044
FY93	0	0.00	1	0.41	0	0.00	0	0	245,711	10,470,755
FY94	0	0.00	0	0.00	0	0.00	0	0	219,206	10,689,961
FY95	0	0.00	1	0.45	0	0.00	0	0	219,880	10,909,841
FY96	0	0.00	1	0.46	0	0.00	0	0	215,105	11,124,946
FY97	0	0.00	3	1.39	0	0.00	0	0	216,500	11,341,446
LIFETIME	77	0.68	120	1.06	63	0.56	132	625	11,341,446	
5 YR AVG	0.0	0.00	1.2	0.54	0.0	0.00	0.0	0.0	223,280.4	
10 YR AVG	0.6	0.24	0.8	0.33	0.0	0.16	0.4	3.0	245,905.2	

Statistics...C-5

C-5 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY68	0	0.00	0	0.00	0	0.00	0	0	24	24
CY69	0	0.00	0	0.00	0	0.00	0	0	472	496
CY70	2	20.66	0	0.00	1	10.33	0	0	9,680	10,176
CY71	1	4.05	0	0.00	0	0.00	0	0	24,699	34,875
CY72	0	0.00	1	2.14	0	0.00	0	0	46,735	81,610
CY73	0	0.00	0	0.00	0	0.00	0	0	49,656	131,266
CY74	2	3.98	3	5.97	1	1.99	0	0	50,263	181,529
CY75	1	2.19	0	0.00	1	2.19	2	155	45,601	227,130
CY76	1	2.44	0	0.00	0	0.00	0	0	40,946	268,076
CY77	0	0.00	3	6.09	0	0.00	0	0	49,289	317,365
CY78	1	2.02	5	10.09	0	0.00	0	0	49,543	366,908
CY79	0	0.00	2	4.04	0	0.00	0	0	49,477	416,385
CY80	1	1.94	3	5.81	0	0.00	0	0	51,594	467,979
CY81	0	0.00	1	1.85	0	0.00	0	0	53,969	521,948
CY82	1	1.95	2	3.89	0	0.00	0	0	51,374	573,322
CY83	2	3.59	2	3.59	0	0.00	0	0	55,681	629,003
CY84	0	0.00	3	5.06	0	0.00	0	0	59,260	688,263
CY85	0	0.00	1	1.67	0	0.00	0	0	59,967	748,230
CY86	1	1.65	0	0.00	0	0.00	0	0	60,516	808,746
TY87	0	0.00	1	1.68	0	0.00	0	0	59,544	868,290
FY88	0	0.00	0	0.00	0	0.00	0	0	56,958	925,248
FY89	1	1.55	0	0.00	0	0.00	0	0	64,346	989,594
FY90	1	1.13	0	0.00	1	1.13	3	13	88,390	1,077,984
FY91	0	0.00	1	0.60	0	0.00	0	0	166,676	1,244,660
FY92	0	0.00	1	1.51	0	0.00	0	0	66,324	1,310,984
FY93	0	0.00	2	2.55	0	0.00	0	0	78,319	1,389,303
FY94	0	0.00	4	5.49	0	0.00	0	0	72,899	1,462,202
FY95	0	0.00	1	1.55	0	0.00	0	0	64,608	1,526,810
FY96	0	0.00	0	0.00	0	0.00	0	0	67,499	1,594,309
FY97	0	0.00	1	1.58	0	0.00	0	0	63,120	1,657,429
LIFETIME	15	0.91	37	2.23	4	0.24	5	168	1,657,429	
5 YR AVG	0.0	0.00	1.6	2.31	0.0	0.00	0.0	0.0	69,289.0	
10 YR AVG	0.2	0.25	1.0	1.27	0.1	0.13	0.3	1.3	78,913.9	

Statistics...C-9

C-9 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY68	0	0.00	0	0.00	0	0.00	0	0	2,184	2,184
CY69	0	0.00	0	0.00	0	0.00	0	0	14,158	16,342
CY70	0	0.00	0	0.00	0	0.00	0	0	21,448	37,790
CY71	1	5.09	0	0.00	1	5.09	3	3	19,644	57,434
CY72	0	0.00	0	0.00	0	0.00	0	0	27,434	84,868
CY73	0	0.00	0	0.00	0	0.00	0	0	29,342	114,210
CY74	0	0.00	0	0.00	0	0.00	0	0	25,835	140,045
CY75	0	0.00	0	0.00	0	0.00	0	0	27,732	167,777
CY76	0	0.00	0	0.00	0	0.00	0	0	28,141	195,918
CY77	0	0.00	0	0.00	0	0.00	0	0	28,908	224,826
CY78	0	0.00	0	0.00	0	0.00	0	0	28,817	253,643
CY79	1	3.49	0	0.00	0	0.00	0	0	28,633	282,276
CY80	0	0.00	1	3.56	0	0.00	0	0	28,061	310,337
CY81	0	0.00	0	0.00	0	0.00	0	0	27,730	338,067
CY82	0	0.00	0	0.00	0	0.00	0	0	28,417	366,484
CY83	0	0.00	0	0.00	0	0.00	0	0	29,450	395,934
CY84	0	0.00	0	0.00	0	0.00	0	0	29,326	425,260
CY85	0	0.00	0	0.00	0	0.00	0	0	29,821	455,081
CY86	0	0.00	0	0.00	0	0.00	0	0	27,851	482,932
TY87	0	0.00	0	0.00	0	0.00	0	0	21,676	504,608
FY88	0	0.00	0	0.00	0	0.00	0	0	28,914	533,522
FY89	0	0.00	0	0.00	0	0.00	0	0	28,730	562,252
FY90	0	0.00	0	0.00	0	0.00	0	0	28,610	590,862
FY91	0	0.00	0	0.00	0	0.00	0	0	26,728	617,590
FY92	0	0.00	0	0.00	0	0.00	0	0	27,260	644,850
FY93	0	0.00	0	0.00	0	0.00	0	0	26,072	670,922
FY94	0	0.00	0	0.00	0	0.00	0	0	25,087	696,009
FY95	0	0.00	1	3.83	0	0.00	0	0	26,119	722,128
FY96	0	0.00	0	0.00	0	0.00	0	0	24,602	746,730
FY97	0	0.00	0	0.00	0	0.00	0	0	22,967	769,697
LIFETIME	2	0.26	2	0.26	1	0.13	3	3	769,697	
5 YR AVG	0.0	0.00	0.2	0.80	0.0	0.00	0.0	0.0	24,969.4	
10 YR AVG	0.0	0.00	0.1	0.38	0.0	0.00	0.0	0.0	26,508.9	

Statistics...B-52

B-52 HISTORY

	CLASS A		CLASS B		DESTROY		FATAL			
YEAR	#	RATE	#	RATE	A/C	RATE	PILOT	ALL	HOURS	CUM HRS
CY55	0	0.00	0	0.00	0	0.00	0	0	4,979	4,979
CY56	4	26.92	0	0.00	3	20.19	5	19	14,860	19,839
CY57	6	10.17	0	0.00	3	5.09	7	16	58,971	78,810
CY58	8	6.50	0	0.00	6	4.88	12	41	123,030	201,840
CY59	5	2.19	1	0.44	3	1.32	1	4	227,973	429,813
CY60	4	1.50	2	0.75	4	1.50	3	8	267,331	697,144
CY61	6	1.77	0	0.00	6	1.77	5	25	338,662	1,035,806
CY62	1	0.25	8	1.98	0	0.00	0	0	403,043	1,438,849
CY63	4	0.98	7	1.71	3	0.73	5	18	408,239	1,847,088
CY64	5	1.22	8	1.95	3	0.73	2	10	409,382	2,256,470
CY65	1	0.25	6	1.51	2	0.50	3	8	397,405	2,653,875
CY66	3	0.74	3	0.74	2	0.50	3	12	403,037	3,056,912
CY67	6	1.66	4	1.11	5	1.38	6	21	361,754	3,418,666
CY68	6	1.54	4	1.03	6	1.54	6	15	389,843	3,808,509
CY69	9	2.97	4	1.32	8	2.64	13	33	302,949	4,111,458
CY70	1	0.43	5	2.17	1	0.43	0	0	230,746	4,342,204
CY71	1	0.47	2	0.94	1	0.47	2	9	212,003	4,554,207
CY72	5	1.44	8	2.31	4	1.16	4	14	346,021	4,900,228
CY73	2	0.93	4	1.85	1	0.46	0	0	216,165	5,116,393
CY74	3	1.88	7	4.39	3	1.88	4	12	159,563	5,275,956
CY75	1	0.71	5	3.54	1	0.71	1	3	141,204	5,417,160
CY76	0	0.00	5	3.64	0	0.00	0	0	137,469	5,554,629
CY77	1	0.74	32	23.75	1	0.74	3	8	134,722	5,689,351
CY78	1	0.75	33	24.80	1	0.75	2	5	133,038	5,822,389
CY79	1	0.75	3	2.25	0	0.00	0	0	133,234	5,955,623
CY80	1	0.77	1	0.77	0	0.00	0	0	130,405	6,086,028
CY81	1	0.75	7	5.24	1	0.75	2	8	133,677	6,219,705
CY82	2	1.64	0	0.00	2	1.64	3	9	122,121	6,341,826
CY83	1	0.95	0	0.00	1	0.95	3	7	104,866	6,446,692
CY84	2	1.92	1	0.96	1	0.96	1	2	103,933	6,550,625
CY85	0	0.00	0	0.00	0	0.00	0	0	105,566	6,656,191
CY86	0	0.00	0	0.00	0	0.00	0	0	102,381	6,758,572
TY87	0	0.00	1	1.25	0	0.00	0	0	80,014	6,838,586
FY88	2	2.04	0	0.00	1	1.02	0	1	98,004	6,936,590
FY89	1	0.99	0	0.00	1	0.99	0	0	100,516	7,037,106
FY90	0	0.00	0	0.00	0	0.00	0	0	91,037	7,128,143
FY91	1	1.09	0	0.00	1	1.09	0	3	91,454	7,219,597
FY92	0	0.00	0	0.00	0	0.00	0	0	69,056	7,288,653
FY93	0	0.00	1	1.88	0	0.00	0	0	53,293	7,341,946
FY94	1	3.11	1	3.11	1	3.11	4	0	32,146	7,374,092
FY95	1	4.13	1	4.13	0	0.00	0	0	24,223	7,398,315
FY96	0	0.00	0	0.00	0	0.00	0	0	25,506	7,423,821
FY97	0	0.00	1	4.38	0	0.00	0	0	22,836	7,446,657
LIFETIME	97	1.30	165	2.22	76	1.02	100	311	7,446,657	
5 YR AVG	0.4	1.27	0.8	2.53	0.0	0.63	0.8	0.0	31,600.8	
10 YR AVG	0.6	0.99	0.4	0.66	0.4	0.66	0.4	0.4	60,807.1	

Statistics...B-1 & F-117

B-1 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY84	0	0.00	1	512.82	0	0.00	0	0	195	195
CY85	0	0.00	1	184.16	0	0.00	0	0	543	738
CY86	0	0.00	0	0.00	0	0.00	0	0	2,676	3,414
TY87	1	11.96	2	23.93	1	11.96	2	3	8,359	11,773
FY88	0	0.00	1	5.08	0	0.00	0	0	19,701	31,474
FY89	2	7.66	0	0.00	2	7.66	0	0	26,100	57,574
FY90	1	3.74	1	3.74	0	0.00	0	0	26,705	84,279
FY91	2	8.56	0	0.00	0	0.00	0	0	23,355	107,634
FY92	3	11.12	0	0.00	0	0.00	0	0	26,970	134,604
FY93	1	3.31	1	3.31	1	3.31	2	4	30,179	164,783
FY94	0	0.00	1	3.40	0	0.00	0	0	29,383	194,166
FY95	0	0.00	3	10.80	0	0.00	0	0	27,781	221,947
FY96	0	0.00	1	3.79	0	0.00	0	0	26,371	248,318
FY97	1	3.94	3	11.82	1	3.94	2	4	25,379	273,697
LIFETIME	11	4.02	15	5.48	5	1.83	6	11	273,697	
5 YR AVG	0.4	1.44	1.8	6.47	0.4	1.44	0.8	1.6	27,818.6	
10 YR AVG	1.0	3.82	1.1	4.20	0.4	1.53	0.4	0.8	26,192.4	

F-117 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
FY91	0	0.00	0	0.00	0	0.00	0	0	1,787	1,787
FY92	1	8.71	0	0.00	1	8.71	0	0	11,481	13,268
FY93	0	0.00	2	15.95	0	0.00	0	0	12,538	25,806
FY94	0	0.00	0	0.00	0	0.00	0	0	12,136	37,942
FY95	2	15.62	0	0.00	1	7.81	1	1	12,804	50,746
FY96	0	0.00	1	7.59	0	0.00	0	0	13,171	63,917
FY97	3	22.99	0	0.00	1	7.66	0	0	13,047	76,964
LIFETIME	6	7.80	3	3.90	3	3.90	1	1	76,964	
5 YR AVG	1.0	7.85	0.6	4.71	0.4	3.14	0.2	0.2	12,739.2	

Statistics...A-10

A-10 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	ALL	HOURS	CUM HRS
CY72	0	0.00	0	0.00	0	0.00	0	0	32	32
CY73	0	0.00	0	0.00	0	0.00	0	0	124	156
CY74	0	0.00	0	0.00	0	0.00	0	0	403	560
CY75	0	0.00	0	0.00	0	0.00	0	0	936	1,496
CY76	0	0.00	0	0.00	0	0.00	0	0	3,678	5,174
CY77	2	11.96	4	23.92	2	11.96	1	2	16,722	21,896
CY78	7	15.72	16	35.92	5	11.23	2	2	44,538	66,434
CY79	8	9.24	2	2.31	8	9.24	4	4	86,544	152,977
CY80	5	3.84	4	3.07	6	4.61	4	4	130,159	283,136
CY81	5	2.86	9	5.15	5	2.86	4	4	174,924	458,060
CY82	4	1.82	1	0.46	3	1.37	0	0	219,349	677,409
CY83	7	3.10	0	0.00	9	3.98	4	4	226,129	903,538
CY84	6	2.68	1	0.45	5	2.23	3	4	224,058	1,127,596
CY85	4	1.78	2	0.89	4	1.78	2	2	224,133	1,351,729
CY86	3	1.37	2	0.91	4	1.82	1	1	219,334	1,571,063
TY87	5	2.92	1	0.58	5	2.92	5	5	171,089	1,742,152
FY88	3	1.37	2	0.92	3	1.37	1	1	218,289	1,960,441
FY89	7	3.03	0	0.00	7	3.03	3	8	230,655	2,191,096
FY90	3	1.35	0	0.00	3	1.35	3	3	222,399	2,414,974
FY91	2	0.88	0	0.00	3	1.31	2	2	228,273	2,641,768
FY92	3	1.79	0	0.00	3	1.79	1	1	167,648	2,809,416
FY93	2	1.74	0	0.00	2	1.74	1	1	115,064	2,924,480
FY94	4	3.35	0	0.00	5	4.19	1	1	119,329	3,043,809
FY95	2	1.69	1	0.84	2	1.69	1	1	118,602	3,162,411
FY96	2	1.63	0	0.00	2	1.63	1	1	122,953	3,285,364
FY97	3	2.43	1	0.81	3	2.43	2	2	123,574	3,408,938
LIFETIME	87	2.55	46	1.35	89	2.61	46	53	3,408,938	
5 YR AVG	2.6	2.17	0.4	0.33	2.8	2.34	1.2	1.2	119,904.4	
10 YR AVG	3.1	1.86	0.4	0.24	3.3	1.98	1.6	2.1	166,678.6	

F-111 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY65	0	0.00	0	0.00	0	0.00	0	0	272	272
CY66	0	0.00	0	0.00	0	0.00	0	0	1,342	1,614
CY67	2	53.60	0	0.00	2	53.60	1	1	3,731	5,345
CY68	5	36.14	4	28.91	5	36.14	0	0	13,837	19,182
CY69	8	25.97	0	0.00	4	12.98	4	4	30,806	49,988
CY70	0	0.00	0	0.00	0	0.00	0	0	10,933	60,921
CY71	2	4.03	3	6.04	2	4.03	2	2	49,673	110,594
CY72	5	6.68	3	4.01	5	6.68	4	4	74,797	185,391
CY73	10	11.39	2	2.28	8	9.11	4	6	87,774	273,165
CY74	3	3.57	2	2.38	2	2.38	2	3	83,957	357,122
CY75	7	8.82	1	1.26	6	7.56	1	2	79,393	436,515
CY76	8	12.75	0	0.00	5	7.97	0	0	62,750	499,265
CY77	7	9.51	12	16.30	7	9.51	4	8	73,628	572,893
CY78	3	4.72	7	11.02	2	3.15	1	2	63,537	636,430
CY79	13	17.11	11	14.48	10	13.16	6	10	75,989	712,419
CY80	4	5.45	6	8.17	4	5.45	4	10	73,431	785,850
CY81	3	3.86	12	15.45	1	1.29	0	0	77,648	863,498
CY82	10	12.68	0	0.00	9	11.41	2	4	78,890	942,388
CY83	3	3.76	1	1.25	3	3.76	1	2	79,755	1,022,143
CY84	3	3.80	1	1.27	3	3.80	3	4	78,973	1,101,116
CY85	0	0.00	1	1.24	0	0.00	0	0	80,870	1,181,986
CY86	0	0.00	1	1.19	0	0.00	0	0	83,921	1,265,907
TY87	3	4.66	0	0.00	3	4.66	1	2	64,344	1,330,251
FY88	3	3.58	2	2.39	3	3.58	3	4	83,686	1,413,937
FY89	2	2.32	0	0.00	2	2.32	1	2	86,262	1,500,199
FY90	5	5.86	0	0.00	4	4.69	1	2	85,357	1,585,556
FY91	1	1.13	7	7.89	1	1.13	1	2	88,710	1,674,266
FY92	2	2.82	1	1.41	2	2.82	1	2	71,029	1,745,295
FY93	1	2.18	0	0.00	1	2.18	0	0	45,924	1,791,219
FY94	0	0.00	1	3.31	0	0.00	0	0	30,180	1,821,399
FY95	1	3.33	3	9.99	1	3.33	0	0	30,016	1,851,415
FY96	1	6.84	0	0.00	1	6.84	0	0	14,617	1,865,760
FY97	0	0.00	0	0.00	0	0.00	0	0	8,065	1,874,097
LIFETIME	115	6.14	81	4.32	96	5.12	47	76	1,874,097	
5 YR AVG	0.6	2.33	0.8	3.11	0.6	2.33	0.0	0.0	25,760.4	
10 YR AVG	1.6	2.94	1.4	2.57	1.5	2.76	0.7	1.2	54,384.6	

Statistics...F-4

F-4 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	ALL	HOURS	CUM HRS
CY71	23	5.27	5	1.15	25	5.73	9	13	436,269	436,269
CY72	30	5.28	5	0.88	30	5.28	18	28	568,706	1,004,975
CY73	25	4.81	11	2.12	25	4.81	13	21	519,446	1,524,421
CY74	21	5.01	4	0.95	21	5.01	9	16	419,577	1,943,998
CY75	19	4.46	3	0.70	15	3.52	8	23	425,582	2,369,580
CY76	24	5.89	4	0.98	19	4.66	11	22	407,606	2,777,186
CY77	23	5.47	81	19.26	17	4.04	12	19	420,527	3,197,713
CY78	11	2.78	101	25.48	12	3.03	8	13	396,350	3,594,063
CY79	24	6.09	45	11.42	24	6.09	12	20	393,891	3,987,954
CY80	14	3.88	9	2.50	13	3.61	9	17	360,491	4,348,445
CY81	25	7.08	13	3.68	26	7.36	9	15	353,214	4,701,659
CY82	12	3.50	7	2.04	11	3.21	5	9	343,186	5,044,845
CY83	14	4.00	1	0.29	13	3.72	6	17	349,925	5,394,770
CY84	11	3.15	0	0.00	12	3.43	2	3	349,657	5,744,427
CY85	11	3.14	5	1.43	9	2.57	4	7	350,597	6,095,024
CY86	14	4.32	4	1.23	14	4.32	4	8	324,011	6,419,035
TY87	13	4.36	1	0.34	14	4.70	8	15	298,062	6,717,097
FY88	12	4.73	3	1.18	9	3.55	4	8	253,486	6,970,583
FY89	6	2.72	1	0.45	4	1.82	2	4	220,354	7,190,937
FY90	13	8.50	0	0.00	14	9.16	4	9	152,886	7,343,823
FY91	4	3.70	0	0.00	4	3.70	1	2	108,172	7,451,995
FY92	0	0.00	2	4.22	0	0.00	0	0	47,356	7,499,351
FY93	1	3.11	0	0.00	1	3.11	0	0	32,182	7,531,533
FY94	1	4.10	0	0.00	1	4.10	1	1	24,394	7,555,927
FY95	1	4.36	0	0.00	1	4.36	0	0	22,953	7,578,880
FY96	1	11.17	0	0.00	1	11.17	0	0	8,956	7,587,836
FY97	0	0.00	0	0.00	0	0.00	0	0	3,865	7,591,701
LIFETIME	353	4.65	305	4.02	335	4.41	1 59	290	7,591,701	
5 YR AVG	1	4.33	0	0.00	1	4.33	0	0	18,470	
10 YR AVG	4	4.46	1	0.69	4	4.00	1	2	87,460	

Statistics...F-15

F-15 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROY A/C	DESTROY RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY72	0	0.00	0	0.00	0	0.00	0	0	25	25
CY73	0	0.00	0	0.00	0	0.00	0	0	826	851
CY74	0	0.00	2	94.79	0	0.00	0	0	2,110	2,961
CY75	1	22.02	0	0.00	1	22.02	0	0	4,541	7,502
CY76	0	0.00	0	0.00	0	0.00	0	0	17,803	25,305
CY77	6	14.16	15	35.40	2	4.72	1	2	42,369	67,674
CY78	8	11.59	30	43.46	7	10.14	1	1	69,023	136,697
CY79	5	5.16	15	15.47	5	5.16	3	3	96,959	233,656
CY80	5	4.57	20	18.30	3	2.74	2	2	109,309	342,965
CY81	5	3.78	4	3.02	6	4.54	5	6	132,291	475,256
CY82	3	1.96	4	2.61	4	2.61	2	2	153,369	628,625
CY83	4	2.36	5	2.95	6	3.54	1	1	169,438	798,063
CY84	3	1.71	2	1.14	4	2.28	1	2	175,515	973,578
CY85	5	2.70	5	2.70	4	2.16	2	2	185,324	1,158,902
CY86	7	3.53	5	2.52	8	4.04	4	4	198,095	1,356,997
TY87	3	1.94	0	0.00	3	1.94	2	2	154,821	1,511,818
FY88	1	0.50	3	1.49	2	0.99	0	0	201,099	1,712,917
FY89	5	2.33	0	0.00	4	1.86	2	2	214,592	1,927,509
FY90	7	3.08	6	2.64	7	3.08	4	5	227,617	2,155,126
FY91	3	1.09	2	0.72	3	1.09	0	0	276,393	2,431,519
FY92	5	2.26	2	0.91	5	2.26	2	3	220,866	2,652,385
FY93	3	1.38	5	2.30	3	1.38	0	0	217,547	2,869,932
FY94	4	1.90	3	1.43	4	1.90	1	1	210,241	3,080,173
FY95	4	1.94	5	2.42	3	1.45	1	2	206,649	3,286,822
FY96	4	1.99	2	1.00	3	1.49	0	0	200,766	3,487,588
FY97	3	1.57	5	2.62	2	1.05	0	0	190,668	3,678,256
LIFETIME	94	2.56	140	3.81	89	2.42	34	40	3,678,256	
5 YR AVG	3.6	1.75	4.0	1.95	3.0	1.46	0.4	0.6	205,174.2	
10 YR AVG	3.9	1.80	3.3	1.52	3.6	1.66	1.0	1.3	216,643.8	

Statistics...F-16 & T-1

F-16 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	ALL	HOURS	CUM HRS
CY75	1	621.12	0	0.00	0	0.00	0	0	161	161
CY76	1	442.48	0	0.00	0	0.00	0	0	226	387
CY77	0	0.00	0	0.00	0	0.00	0	0	856	1,243
CY78	0	0.00	0	0.00	0	0.00	0	0	1,402	2,645
CY79	2	30.64	0	0.00	2	30.64	0	0	6,527	9,172
CY80	5	18.65	2	7.46	4	14.92	0	0	26,803	35,975
CY81	5	8.86	0	0.00	4	7.09	1	1	56,423	92,398
CY82	17	15.83	0	0.00	16	14.90	4	4	107,389	199,787
CY83	11	7.30	0	0.00	9	5.97	5	6	150,728	350,515
CY84	10	5.01	0	0.00	9	4.51	6	6	199,761	550,276
CY85	10	4.55	0	0.00	11	5.01	5	5	219,647	769,923
CY86	11	4.32	2	0.79	11	4.32	3	3	254,491	1,024,414
TY87	8	3.43	4	1.71	9	3.85	3	3	233,560	1,257,974
FY88	23	6.80	5	1.48	20	5.92	6	8	338,039	1,596,013
FY89	14	3.63	1	0.26	14	3.63	3	3	385,179	1,981,192
FY90	13	3.19	4	0.98	14	3.43	4	7	408,078	2,389,270
FY91	21	4.55	1	0.22	21	4.55	5	5	461,451	2,850,721
FY92	18	4.04	1	0.22	18	4.04	8	9	445,201	3,295,922
FY93	18	4.15	2	0.46	18	4.15	4	5	433,960	3,729,882
FY94	17	4.24	1	0.25	15	3.75	3	27	400,484	4,130,366
FY95	9	2.33	2	0.52	9	2.33	1	1	386,445	4,516,811
FY96	8	2.14	5	1.34	7	1.87	0	1	374,530	4,891,341
FY97	11	2.98	1	0.27	10	2.71	1	1	369,587	5,260,928
LIFETIME	233	4.43	31	0.59	221	4.20	62	95	5,260,928	
5 YR AVG	12.6	4.11	2.2	0.72	11.8	3.85	1.0	6.0	306,209.2	
10 YR AVG	12.9	3.52	1.8	0.49	12.6	3.44	2.9	5.9	366,491.5	

T-1 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	ALL	HOURS	CUM HRS
FY92	0	0.00	0	0.00	0	0.00	0	0	1	1
FY93	0	0.00	0	0.00	0	0.00	0	0	18,063	18,064
FY94	0	0.00	0	0.00	0	0.00	0	0	32,304	50,368
FY95	0	0.00	0	0.00	0	0.00	0	0	41,055	91,423
FY96	0	0.00	0	0.00	0	0.00	0	0	48,186	139,609
FY97	0	0.00	0	0.00	0	0.00	0	0	60,141	199,750
LIFETIME	0	0.00	0	0.00	0	0.00	0	0	199,750	
5 YR AVG	0	0.00	0	0.00	0	0.00	0	0	39,950	

Statistics...T-37

T-37 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY56	1	149.25	0	0.00	0	0.00	0	0	670	670
CY57	1	14.90	0	0.00	1	14.90	0	0	6,713	7,383
CY58	5	8.79	2	3.51	13	5.27	0	3	56,908	64,291
CY59	14	9.23	2	1.32	14	9.23	0	4	151,713	216,004
CY60	8	3.17	2	0.79	7	2.77	0	5	252,361	468,365
CY61	9	4.08	3	1.36	7	3.18	1	2	220,362	688,727
CY62	14	4.70	2	0.67	15	5.04	3	7	297,765	986,492
CY63	5	1.53	3	0.92	5	1.53	3	6	326,348	1,312,840
CY64	8	2.11	4	1.06	7	1.85	1	5	378,410	1,691,250
CY65	7	1.99	1	0.28	8	2.27	3	7	351,848	2,043,098
CY66	2	0.53	0	0.00	3	0.80	1	1	376,716	2,419,814
CY67	4	0.99	0	0.00	4	0.99	2	4	405,880	2,825,694
CY68	4	0.92	0	0.00	4	0.92	0	1	433,597	3,259,291
CY69	9	1.79	1	0.20	10	1.99	5	11	502,492	3,761,783
CY70	5	0.99	0	0.00	5	0.99	1	4	503,447	4,265,230
CY71	2	0.43	1	0.22	3	0.65	0	0	463,844	4,729,074
CY72	4	0.91	1	0.23	5	1.14	1	2	439,929	5,169,003
CY73	3	0.71	1	0.24	2	0.47	1	2	422,721	5,591,724
CY74	1	0.33	1	0.33	1	0.33	0	1	305,106	5,896,830
CY75	1	0.33	1	0.33	1	0.33	1	1	301,353	6,198,183
CY76	2	0.70	4	1.41	2	0.70	0	0	284,548	6,482,731
CY77	1	0.38	0	0.00	1	0.38	0	0	263,718	6,746,449
CY78	3	1.16	2	0.78	3	1.16	0	0	257,599	7,004,048
CY79	1	0.34	0	0.00	1	0.34	0	0	295,890	7,299,938
CY80	4	1.42	0	0.00	4	1.42	0	3	282,066	7,582,004
CY81	2	0.68	0	0.00	2	0.68	0	1	295,614	7,877,618
CY82	2	0.63	0	0.00	1	0.31	1	2	318,348	8,195,966
CY83	1	0.30	0	0.00	1	0.30	0	1	328,836	8,524,802
CY84	1	0.31	0	0.00	1	0.31	0	0	320,175	8,844,977
CY85	1	0.32	0	0.00	1	0.32	0	0	312,805	9,157,782
CY86	1	0.32	0	0.00	1	0.32	0	0	312,587	9,470,369
TY87	0	0.00	0	0.00	0	0.00	0	0	240,762	9,711,131
FY88	1	0.31	0	0.00	1	0.31	0	0	318,268	10,029,399
FY89	1	0.32	0	0.00	1	0.32	0	0	314,105	10,343,504
FY90	0	0.00	0	0.00	0	0.00	0	0	306,885	10,650,389
FY91	0	0.00	0	0.00	0	0.00	0	0	279,593	10,929,982
FY92	2	0.85	0	0.00	3	1.28	2	2	234,830	11,164,812
FY93	1	0.56	0	0.00	1	0.56	0	0	179,933	11,344,745
FY94	0	0.00	0	0.00	0	0.00	0	0	151,651	11,496,396
FY95	1	0.74	0	0.00	1	0.74	0	0	134,425	11,630,821
FY96	0	0.00	0	0.00	0	0.00	0	0	144,079	11,774,230
FY97	1	0.62	0	0.00	1	0.62	0	0	162,442	11,937,342
LIFETIME	133	1.11	31	0.26	131	1.10	26	75	1,937,342	
5 YR AVG	0.6	0.39	0.0	0.00	0.6	0.39	0.0	0.0	154,506.0	
10 YR AV	0.7	0.31	0.0	0.00	0.8	0.36	0.2	0.2	222,621.1	

Statistics...T-38

T-38 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY60	0	0.00	0	0.00	0	0.00	0	0	974	974
CY61	0	0.00	0	0.00	0	0.00	0	0	5,386	6,360
CY62	3	7.15	1	2.38	3	7.15	0	1	41,945	48,305
CY63	5	4.63	3	2.78	4	3.70	1	3	108,106	156,411
CY64	6	2.87	3	1.43	6	2.87	1	2	209,285	365,696
CY65	10	3.83	2	0.77	10	3.83	4	7	260,961	626,657
CY66	13	3.63	2	0.56	10	2.79	3	5	358,001	984,658
CY67	13	2.91	1	0.22	13	2.91	3	8	447,443	1,432,101
CY68	10	1.98	1	0.20	9	1.78	5	10	504,977	1,937,078
CY69	9	1.55	5	0.86	7	1.21	3	5	579,768	2,516,846
CY70	17	2.81	1	0.17	17	2.81	7	12	605,430	3,122,276
CY71	7	1.22	2	0.35	5	0.87	4	7	571,569	3,693,845
CY72	9	1.68	1	0.19	10	1.87	2	5	535,538	4,229,383
CY73	7	1.49	1	0.21	5	1.07	2	3	468,761	4,698,144
CY74	9	2.24	0	0.00	9	2.24	6	10	402,336	5,100,480
CY75	1	0.26	1	0.26	1	0.26	0	0	378,955	5,479,435
CY76	8	2.52	2	0.63	8	2.52	4	9	317,300	5,796,735
CY77	8	2.37	17	5.04	8	2.37	5	6	337,071	6,133,806
CY78	7	2.25	23	7.40	7	2.25	1	4	310,702	6,444,508
CY79	5	1.51	3	0.91	4	1.21	0	0	330,325	6,774,833
CY80	4	1.19	4	1.19	4	1.19	2	4	335,813	7,110,646
CY81	6	1.77	1	0.29	6	1.77	3	3	338,986	7,449,632
CY82	3	0.83	0	0.00	6	1.66	5	5	362,514	7,812,146
CY83	5	1.36	2	0.54	5	1.36	1	3	367,891	8,180,037
CY84	3	0.80	3	0.80	4	1.07	3	5	373,825	8,553,862
CY85	2	0.55	3	0.83	2	0.55	1	2	362,845	8,916,707
CY86	4	1.14	1	0.29	4	1.14	2	3	349,457	9,266,164
TY87	2	0.75	1	0.37	3	1.12	3	6	267,009	9,533,173
FY88	2	0.57	2	0.57	2	0.57	1	1	351,132	9,884,305
FY89	2	0.54	1	0.27	2	0.54	2	2	370,026	10,254,331
FY90	2	0.55	2	0.55	2	0.55	0	0	361,878	10,616,209
FY91	1	0.30	0	0.00	1	0.30	0	2	337,134	10,953,343
FY92	1	0.38	0	0.00	0	0.00	1	1	265,369	11,218,712
FY93	3	1.33	0	0.00	3	1.33	0	0	225,105	11,443,817
FY94	0	0.00	0	0.00	0	0.00	0	0	194,161	11,637,978
FY95	1	0.63	0	0.00	1	0.63	0	0	158,422	11,796,400
FY96	1	0.75	0	0.00	1	0.75	0	0	133,959	11,930,359
FY97	0	0.00	0	0.00	0	0.00	0	0	136,264	12,066,623
LIFETIME	189	1.57	89	0.74	182	1.51	75	134	12,066,623	
5 YR AVG	1.0	0.59	0.0	0.00	1.0	0.59	0.0	0.0	169,582.2	
10 YR AVG	1.0	0.51	0.5	0.20	1.2	0.47	0.4	0.6	253,345.0	

Statistics...T-3 & H-60

T-3 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
FY94	0	0.00	0	0.00	0	0.00	0	0	2,663	2,663
FY95	1	4.34	0	0.00	1	4.34	1	2	23,062	25,725
FY96	1	3.30	0	0.00	1	3.30	1	2	30,337	56,062
FY97	1	3.08	0	0.00	1	3.08	1	2	32,453	88,515
LIFETIME	3	3.39	0	0.00	3	3.39	3	6	88,515	

H-60 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY82	0	0.00	0	0.00	0	0.00	0	0	112	112
CY83	0	0.00	0	0.00	0	0.00	0	0	3,147	3,259
CY84	0	0.00	0	0.00	0	0.00	0	0	4,132	7,391
CY85	0	0.00	0	0.00	0	0.00	0	0	2,992	10,383
CY86	0	0.00	0	0.00	0	0.00	0	0	3,955	14,338
TY87	1	44.42	0	0.00	1	44.42	2	4	2,251	16,589
FY88	0	0.00	0	0.00	0	0.00	0	0	4,216	20,805
FY89	0	0.00	0	0.00	0	0.00	0	0	5,591	26,396
FY90	0	0.00	0	0.00	0	0.00	0	0	7,849	34,245
FY91	1	6.85	0	0.00	0	0.00	0	0	14,594	48,839
FY92	1	5.15	0	0.00	1	5.15	0	1	19,401	68,240
FY93	1	4.37	0	0.00	1	4.37	1	12	22,871	91,111
FY94	2	8.25	1	4.13	1	4.13	0	0	24,229	115,340
FY95	1	3.75	1	3.75	1	3.75	2	5	26,666	142,006
FY96	0	0.00	0	0.00	0	0.00	0	0	27,809	169,815
FY97	0	0.00	0	0.00	0	0.00	0	0	26,460	196,275
LIFETIME	7	3.57	2	1.02	5	2.55	5	22	196,275	
5 YR AVG	0.8	3.12	0.4	1.56	0.6	2.34	0.6	3.4	25,607.0	
10 YR AVG	0.6	3.34	0.2	1.1	0.4	2.23	0.3	1.8	17,968.6	

Statistics...UH-1

UH-1 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	ALL	HOURS	CUM HRS
CY71	0	0.00	0	0.00	0	0.00	0	0	15,900	15,900
CY72	3	14.22	0	0.00	2	9.48	1	3	21,097	36,997
CY73	0	0.00	0	0.00	0	0.00	0	0	20,026	57,023
CY74	1	5.18	0	0.00	1	5.18	0	2	19,315	76,338
CY75	0	0.00	1	4.51	0	0.00	0	0	22,197	98,535
CY76	0	0.00	0	0.00	0	0.00	0	0	12,896	111,431
CY77	0	0.00	0	0.00	0	0.00	0	0	19,729	131,160
CY78	1	4.19	2	8.39	1	4.19	0	0	23,838	154,998
CY79	0	0.00	0	0.00	0	0.00	0	0	24,703	179,701
CY80	1	4.34	0	0.00	1	4.34	0	0	23,041	202,742
CY81	0	0.00	0	0.00	0	0.00	0	0	24,385	227,127
CY82	0	0.00	1	4.07	0	0.00	0	0	24,547	251,674
CY83	0	0.00	0	0.00	0	0.00	0	0	24,978	276,652
CY84	1	4.02	0	0.00	1	4.02	2	5	24,846	301,498
CY85	0	0.00	0	0.00	0	0.00	0	0	46,977	348,475
CY86	1	2.17	0	0.00	1	2.17	2	5	46,101	394,576
TY87	0	0.00	0	0.00	0	0.00	0	0	32,895	427,471
FY88	0	0.00	0	0.00	0	0.00	0	0	30,774	458,245
FY89	0	0.00	0	0.00	0	0.00	0	0	31,253	489,498
FY90	0	0.00	0	0.00	0	0.00	0	0	30,704	520,202
FY91	1	3.32	1	3.32	1	3.32	1	2	30,087	550,289
FY92	2	7.21	0	0.00	2	7.21	3	7	27,729	578,018
FY93	0	0.00	0	0.00	0	0.00	0	0	25,945	603,963
FY94	1	4.15	1	4.15	1	4.15	0	0	24,099	628,062
FY95	1	4.60	0	0.00	1	4.60	0	0	21,761	649,823
FY96	1	4.73	0	0.00	1	4.73	0	0	21,141	670,964
FY97	0	0.00	0	0.00	0	0.00	0	0	20,452	691,316
LIFETIME	14	2.02	6	0.87	13	1.88	9	24	691,416	
5 YR AVG	0.6	2.65	0.2	0.88	0.6	2.65	0.0	0.0	22,679.6	
10 YR AVG	0.6	2.27	0.2	0.76	0.6	2.27	0.4	0.9	26,394.5	

Statistics...H-53

H-53 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY66	0	0.00	0	0.00	0	0.00	0	0	22	22
CY67	0	0.00	0	0.00	0	0.00	0	0	1,517	1,539
CY68	0	0.00	0	0.00	0	0.00	0	0	5,272	6,811
CY69	2	21.66	0	0.00	1	10.83	2	3	9,232	16,043
CY70	0	0.00	0	0.00	0	0.00	0	0	13,922	29,965
CY71	1	4.87	0	0.00	1	4.87	0	0	20,528	50,493
CY72	0	0.00	0	0.00	0	0.00	0	0	23,299	73,792
CY73	2	10.94	1	5.47	1	5.47	0	0	18,279	92,071
CY74	0	0.00	0	0.00	0	0.00	0	0	16,439	108,510
CY75	3	18.81	0	0.00	3	18.81	6	43	15,947	124,457
CY76	1	7.01	0	0.00	1	7.01	2	4	14,261	138,718
CY77	2	13.08	4	26.16	2	13.08	0	1	15,292	154,010
CY78	0	0.00	6	40.16	0	0.00	0	0	14,942	168,952
CY79	1	8.05	0	0.00	1	8.05	2	3	12,429	181,381
CY80	2	15.90	0	0.00	1	7.95	0	1	12,578	193,959
CY81	2	14.38	0	0.00	1	7.19	3	6	13,912	207,871
CY82	1	7.43	0	0.00	1	7.43	3	4	13,452	221,323
CY83	0	0.00	2	14.49	0	0.00	0	0	13,805	235,128
CY84	2	14.53	0	0.00	2	14.53	2	6	13,762	248,890
CY85	1	8.56	0	0.00	1	8.56	3	7	11,687	260,577
CY86	2	16.39	1	8.19	2	16.39	1	1	12,205	272,782
TY87	1	11.20	0	0.00	0	0.00	0	1	8,925	281,707
FY88	0	0.00	0	0.00	0	0.00	0	0	10,804	292,511
FY89	1	9.57	0	0.00	0	0.00	0	0	10,453	302,964
FY90	0	0.00	0	0.00	0	0.00	0	0	12,223	315,187
FY91	0	0.00	1	8.63	0	0.00	0	0	11,594	326,781
FY92	0	0.00	0	0.00	0	0.00	0	0	12,238	339,019
FY93	0	0.00	0	0.00	0	0.00	0	0	12,019	351,038
FY94	0	0.00	0	0.00	0	0.00	0	0	12,106	363,144
FY95	1	8.43	1	8.43	1	8.43	0	0	11,857	375,001
FY96	1	7.44	0	0.00	0	0.00	0	0	13,436	388,415
FY97	0	0.00	0	0.00	0	0.00	0	0	12,522	400,959
LIFETIME	26	6.48	16	3.99	19	4.74	24	80	400,959	
5 YR AVG	0	0.4	0.2	0.00	0.2	0.00	0.0	0.0	12,388.0	
10 YR AVG	0	0.3	0.2	0.00	0.1	0.00	0.0	0.0	11,925.2	

Statistics...U-2

U-2 HISTORY

YEAR	CLASS A #	CLASS A RATE	CLASS B #	CLASS B RATE	DESTROYED A/C	DESTROYED RATE	FATAL PILOT	FATAL ALL	HOURS	CUM HRS
CY63	0	0.00	0	0.00	0	0.00	0	0	0	0
CY64	1	0.00	0	0.00	1	0.00	1	1	0	0
CY65	0	0.00	0	0.00	0	0.00	0	0	0	0
CY66	0	0.00	0	0.00	0	0.00	0	0	0	0
CY67	2	0.00	0	0.00	2	0.00	0	0	0	0
CY68	1	0.00	0	0.00	1	0.00	0	0	0	0
CY69	0	0.00	0	0.00	0	0.00	0	0	0	0
CY70	0	0.00	0	0.00	0	0.00	0	0	4,413	4,413
CY71	0	0.00	0	0.00	0	0.00	0	0	4,241	8,654
CY72	2	25.87	0	0.00	1	12.93	1	1	7,732	16,386
CY73	1	9.33	0	0.00	0	0.00	0	0	10,718	27,104
CY74	0	0.00	0	0.00	0	0.00	0	0	11,425	38,529
CY75	3	27.80	1	9.27	3	27.80	0	0	10,791	49,320
CY76	0	0.00	0	0.00	0	0.00	0	0	8,717	58,037
CY77	0	0.00	0	0.00	0	0.00	0	0	9,395	67,432
CY78	1	11.19	0	0.00	1	11.19	1	5	8,934	76,366
CY79	0	0.00	0	0.00	0	0.00	0	0	10,128	86,494
CY80	2	19.84	0	0.00	1	9.92	0	0	10,080	96,574
CY81	1	9.79	0	0.00	1	9.79	0	0	10,211	106,785
CY82	0	0.00	0	0.00	0	0.00	0	0	10,131	116,916
CY83	0	0.00	0	0.00	0	0.00	0	0	12,555	129,471
CY84	2	15.09	0	0.00	2	15.09	0	0	13,257	142,728
CY85	1	8.48	0	0.00	1	8.48	0	0	11,788	154,516
CY86	0	0.00	0	0.00	0	0.00	0	0	13,954	168,470
TY87	0	0.00	0	0.00	0	0.00	0	0	16,786	185,256
FY88	0	0.00	0	0.00	0	0.00	0	0	16,730	201,986
FY89	0	0.00	0	0.00	0	0.00	0	0	17,620	219,606
FY90	1	5.56	0	0.00	1	5.56	0	0	18,001	237,607
FY91	0	0.00	0	0.00	0	0.00	0	0	19,820	257,427
FY92	1	6.03	0	0.00	1	6.03	1	1	16,597	274,024
FY93	0	0.00	0	0.00	0	0.00	0	0	18,085	292,109
FY94	2	12.79	0	0.00	2	12.79	1	1	15,643	307,752
FY95	1	5.64	0	0.00	1	5.64	1	1	17,726	325,478
FY96	2	12.11	0	0.00	1	6.05	1	2	16,518	341,996
FY97	1	8.34	0	0.00	0	0.00	0	0	11,991	353,987
LIFETIME	25	7.06	0	0.00	20	5.65	7	12	353,987	
5 YR AVG	1.2	7.50	0.0	0.00	0.8	5.00	0.6	0.8	15,992.6	
10 YR AVG	0.8	4.74	0.0	0.00	0.6	3.56	0.4	0.5	16,873.1	

A-10 Mishaps FY97

USAF Photo by SSgt Andrew N. Dunaway, II

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FY97 was a relatively good year for the A-10 community. In all, there were 3 Class A's, 1 Class B, and 24 Class C mishaps. Unfortunately, the Class A's accounted for two fatalities. The evidence contained in the AFI 51-503 accident investigations show what happened.

In the early spring, while flying as an SEFE for a combined instrument/ qualification check ride that included AHC, air refueling, and strange field approaches, the mishap pilot followed the examinee on a full-stop GCA, then pulled up to a right closed for a full-stop landing. During the final turn, the pilot sustained fatal injuries when the A-10 impacted the ground approximately 1/2 mile from the button of the runway and left of the centerline. (Note: "Button" is Canadian for approach end.)

The MP was in the habit of flying tight patterns, and on this particular approach, due to winds aloft, the aircraft was very close to the runway on the downwind leg. Rather than rolling wings level at some point during the final turn and initiating an overshoot, the mishap pilot attempted to salvage the landing and stalled the aircraft at a point where recovery was impossible.

The year's second Class A mishap saw No. 4 in a four-plane formation strike a radio tower. Fortunately, although the aircraft became immediately uncontrollable, the pilot was able to eject and suffered only minor injuries.

Although the mission briefing addressed general obstacle clearance procedures, specific obstructions were not identified. The mishap pilot saw the incident tower shortly before impact but lost positional awareness almost immediately thereafter. Perceiving obstacle passage, the MP initiated a vector to close on No. 3's flightpath and a descent. The necessity of formation flight dictated that the MP focus attention primarily on No. 3 to the detriment of aircraft flightpath clearance. The tower was reacquired just before impact, and although the pilot initiated an avoidance maneuver, his vector precluded success.

In the third Class A mishap of FY97, during a two-ship night surface attack tactical continuation training mission using night vision goggles (NVGs), No. 2 impacted the ground following a dive bomb attack. The pilot was fatally injured.

The mishap pilot, recently proficient in the use of NVGs, became disoriented following weapons delivery. While unusual attitude recovery action was initiated, the aircraft hit the ground with no indication of an attempted ejection.

While the good news is that there were few serious incidents involving A-10s in FY97, the bad news is that all of the Class A's were avoidable and simply variations of previous Air Force incidents. We have not devised any new ways to prang aircraft.

Lots of pilots have lost their lives, and perhaps cost those of others, because they exceeded their own capabilities or those of their aircraft. It matters little whether the pilot is the least or most talented individual in the squadron. If he or she pushes his or her own personal performance limits to the point where they exceed those detailed in orders, eventually a mishap will occur. If the pilot is lucky, the result will simply be a full pair of jock-

continued on next page

USAF Photo by SSgt Andrew N. Dunaway, II

ey shorts and, thanks to learning through intensity, a lifelong lesson in airmanship. Unhappily, the outcome is too often a fatality.

A breakdown of situational awareness or a momentary lapse of basic airmanship historically ranks as one of the primary factors in aircraft mishaps. Flying a planned low-level routing, it seems obvious that known obstacles be briefed. Passing through an area with reported obstacles, airmanship would dictate that flightpath clearance is the highest priority. Losing visual contact with an obstacle or another aircraft and having no way to ensure safe passage is a severe loss of situational awareness. Good airmanship dictates an immediate climb or maneuver to avoid the last known position of the obstacle or other aircraft.

One of the most challenging sorties in the A-10 is night surface attack using NVGs. Entry into an unusual attitude can be difficult to recognize, particularly with attention focused outside the cockpit. Unless unusual attitude recognition is immediate, the pilot is already well behind the power curve. Any other distractions such as communications, threat avoidance, or even off-target tactics can prevent the pilot from conducting a basic instrument check. By the time the unusual attitude is recognized, task saturation and time compression can prevent or delay proper analysis and reaction. Regulations, orders, directives, and procedures all exist to keep the pilot alive, but they cannot cover every possible circumstance. For that, the pilot must rely on common sense. In a surprising number of cases this means simply *"Fly the aircraft!"*

The most disconcerting thing is that we do not seem to learn from the deaths of our comrades. Of course, after an incident, we go through all of the proper procedures—we have safety and accident investigations, we make safety recommendations, we change regulations, and sometimes we even make changes to the aircraft. Despite all of our efforts, someone always manages to intentionally or otherwise circumvent the safeguards.

Fighter/attack pilots have attitudes. They have to! If a combat-ready pilot does not know that he or she is better than the opposition, that pilot has no business in the cockpit. Unfortunately, this attitude, often perceived as cockiness, prevents many pilots from saying, "No, I can't do that," "No, I'm not ready," "No, I'm too tired to safely do that," or "I don't think that's safe." All military personnel have a can-do attitude, and there is a perception that avoiding or admitting the inability to complete an operational tasking causes loss of face. Operational Risk Management (ORM) gives pilots and supervisors tools to identify these missions without losing face. From the line operators' standpoint, ORM allows direct feedback to supervisors without the fear of a bad performance evaluation because, unlike in years gone by, supervisors will expect questions and honest evaluations of mission readiness as well as risks.

The mishap rate has leveled off but, although the number of serious accidents is low, we are still not at zero. We can continue to improve. We need to identify the individuals who intentionally exceed the approved parameters. We need people to identify their own training deficiencies. We need to stress basic airmanship at all levels of training and on all airframes. We need to emphasize that equipment is expendable—people are not.

It's easy to armchair quarterback, and hindsight is 20-20. Any of this year's A-10 Class A accidents could have happened to virtually any pilot given certain circumstances. The goal is to change the pilot mindset so that, given any situation, training and common sense pre-dispose the individual to react in the most appropriate manner. This could mean questioning a proposed mission plan, expressing concern about your own or someone else's proficiency, or leveling the wings and climbing just because something does not quite "feel" right.

Society and, willingly or unwillingly, the Armed Forces are evolving organisms. Public awareness and scrutiny have increased accountability and, in combination with a multitude of other socioeconomic and political factors, this has resulted in military system and personnel budget reductions. If we are to ensure that the defense assets are going to be available when we need them, it is imperative that we get the maximum training value out of each sortie and that we use our resources wisely. This means eliminating loss of lives and aircraft, particularly those losses that are a result of incompetence, indecision, or indifference. ✈

F-15

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FY97: A good, yet somewhat lucky, year in the F-15 world.

The USAF F-15 community experienced three Class A mishaps (over $1 million damages) for a 1.57 rate (mishaps per 100,000 flying hours), a one-mishap improvement over last year, in which the rate was 1.99. The overall fighter/attack Class A rate for '97 was 2.98. The USAF 10-year average for F-15 Class A's is 1.8; lifetime we're looking at 2.56 over nearly 3.7 million hours. So, statistically, we had a relatively good showing for that 12-month period. Let's sort a little deeper.

All the three Class A's had some engine involvement. I won't go into great detail here; look for the annual "Engine-Related Mishaps" article in next month's edition.

- A C-model experienced a first-stage fan disc failure just after brake release on takeoff. The pilot made a timely abort and an even timelier ground egress as the aircraft quickly caught fire and burned.
- An E-model crew had a right engine bleed air malfunction indication at low altitude on a weapons pass. During the ensuing transition from routine mission to emergency divert, the left engine was shut down about the same time as the right engine responded to the depressed right engine fire light. Two successful ejections later, the aircraft went into the local river and was destroyed.
- A different E-model experienced engine problems shortly after takeoff. The "bad" engine was shut down, and the "good" engine provided plenty of thrust to RTB. The problem was traced to fuel nozzle coking, which led to low pressure turbine distress and subsequent engine failure.

Five Class B's this year, for a 2.62 rate.

- Two of the mishaps involved E-models taking bird strikes. The first one caused significant damage to the targeting pod. In the other case, the bird damaged an engine.
- A C-model was damaged by unexpected debris when the missile it fired failed shortly after launch.
- A D-model encountered some braking problems while rolling out on a wet runway. After departing the end of the prepared surface, the aircraft plowed through wet grass until the nose gear collapsed.
- A full D-model experienced an engine fire in the traffic pattern. The aircraft was promptly landed, limiting the damage.

There were 83 Class C's reported (as of this writing). Thirty-eight of them involved engine problems or resulted in engines being shut down for a variety of problems. The veteran A/B models accounted for 2, the C/D's reported 25, and the Dark Side had 11. Departures were the second leading Class C-generator with 16 reported, all from the C/D world. Eleven were attributed to the pilot; five had flight controls involvement. There were 12 cases of dropped objects or parts of the aircraft falling off. A few involved delamination, probably due to water intrusion, but there was also a little matter of a rudder missing. The remainder of the Class C's involved weather-related problems, bird strikes, and "others."

Additionally, there were eight physiological incidents reported. Five of them involved either problems with the oxygen regulator or contaminated oxygen. There were also a couple canopy seal or cockpit pressure regulator problems.

USAF Photo by SSgt Andrew N. Dunaway, II

The FOD monsters were busy this year again. FOD accounted for eight reported cases of Class B damage to our engines. There were also seven FOD incidents reported with Class C or less dollar damage.

In my first sentence I remarked that this was a lucky year. As I review the reports on the Class B's, the C's, FODs, and physio's, I see a very fine line between them and Class A's of the past. Many of them were easily preventable. Okay, "luck" isn't the right word. Good engineering, training, maintenance, flying skills, and discipline are what it takes to fly safely consistently. Let your guard down for an instant, don't check your own six, and you are a candidate for the mort locker. It's a fact. I encourage you to grab a Class A mishap report, any of them, and review it for how things went wrong. Usually the factors leading up to a Class A aren't major, but they are preventable. Make sure you are doing your best, every day, all year.

The F-15 remains the best and the safest fighter in the world. Again, no fatalities this year. Excellent work! Make '98 a safe year for you and your wingmen. ✈

Viper Mishaps FY97

MAJ DON TAYLOR
HQ AFSC/SEFF

We were lucky this year. That's right, I said lucky. The Air Force experienced 11 F-16 Class A's in FY97. Out of these, 11 F-16s were completely destroyed, 2 were badly damaged, and there was 1 pilot fatality. This equates to a rate of 2.98 and makes FY97 the third best year in the history of the Viper. This sounds good, but it isn't. Out of 11 mishaps, 5 were of the type that traditionally end in the death of one or more pilots—one spatial disorientation, one G loss of consciousness, one out of control, and two midair collisions. Both midairs involved a C-model and a D-model with both seats occupied and explains the two badly damaged aircraft already mentioned.

The purpose of this article is twofold. First, I want you to think! I will review each of this year's Class A accidents. As you read these narratives, I ask that you think each one through. If you fly the F-16, put yourself in the cockpit confronted with the same situation as the mishap pilot or think of yourself as a supporting wingman. If you're also a supervisor of flying or an operations supervisor, view each mishap in that capacity also. Use these narratives as a mental EP review and as real-world examples in your SEPT and simulator training. And second, as an accident investigator and fellow F-16 pilot, I would like to voice some concerns I have based on the accidents I've reviewed this year. Having access to all the mishap reports in the Viper community, I can hopefully offer some insights and advice based on my collective knowledge of the final messages.

Class A Mishaps

The Safety Center database classifies mishaps as logistics-related, operations-related, environment-related, or undetermined. Here is how this year's mishaps were categorized. (The facts are taken from the AFI 51-503, Accident Investigation.)

Class A Mishaps—Operations-Related

• A four-ship briefed and flew a night intercept mission. The weather was clear, but there was no discernable horizon. On the fourth intercept, the mishap pilot (MP) entered an unusual attitude and crashed without attempting an ejection or making a radio call.

• A five-ship briefed to fly a special mission that involved taking photographs of the formation. No. 5 was a D-model with a professional photographer in the backseat. The photographer planned to take pictures of No. 1 through 3, while No. 4 remained well clear and acted as a safety observer. During one of the photo passes, Nos. 1 and 5 collided. The No. 1 aircraft went uncontrollable, and the pilot had to eject. No. 5 was able to land with significant damage to the aircraft.

• Two pilots in a D-model went out to fly a single-ship instrument/advanced handling characteristics sortie. During a nose-high maneuver, the airplane ran out of airspeed and suddenly departed into an inverted spin. Within a couple of seconds, the spin transitioned to an inverted stall characterized by significant pitch and roll oscillations. Just prior to breaking the stall, both pilots heard a series of bangs, and the engine started winding back. After recovering to level flight, the pilots accomplished the first few steps of the engine failure Critical Action Procedures (CAP), but due to low altitude had to initiate an ejection.

• The MP was No. 2 on a three-ship Air Combat Maneuvers sortie. During the fourth engagement, the designated bandit engaged the mishap pilot from an offensive position. In an effort to defeat the bandit, the MP initiated a high-G defensive turn and experienced a G loss of consciousness (GLOC). The MP regained consciousness but was so disoriented he had to eject.

• A two-ship departed for a night vision goggle intercept mission. No. 1 was a D-model with an instructor pilot in the backseat and an experienced pilot on a recurrency mission in the front seat. The plan was for No. 1 to take off second and perform a trail departure on No. 2. Sometime during the departure, No. 1 collided with No. 2. The D-model went out of control, and both pilots ejected successfully. The pilot of the C-model was able to return to base (RTB) with significant damage to the aircraft.

Class A Mishaps—Logistics-Related

• A four-ship departed on a night air-to-air refueling mission after which they were to break up into two two-ship formations. After splitting the four-ship, the MP and his wingman started a descent and RTB. Suddenly, the MP heard a loud "bang" and felt severe airframe vibrations. The wingman saw sparks and flames trailing from the exhaust nozzle. The MP started his CAPs, but to compound matters, one of his wing tanks didn't jettison, and the cockpit suddenly went dark. Noticing a malfunctioning Emergency Power Unit (EPU), he cycled the EPU switch from NORM to OFF to ON and regained emergency power. Approximately half a minute later, the EPU fell off line again, leaving the MP in total darkness and without a radio. With no indication of an airstart, the MP successfully ejected.

• A two-ship formation entered the bombing range to practice Surface Attack Tactics. After a 10-degree/20-degree HI element attack with live MK 82 general purpose bombs, No. 2 heard a thump. The aircraft began vibrat-

USAF Photo by SSgt Andrew N. Dunaway, II

ing as the master caution and engine warning lights illuminated. The MP performed the engine failure CAPs, but the engine did not respond. One wing tank stayed attached to the aircraft, but the decreased glide ratio was not significant because of the long distance to a suitable airfield. The pilot successfully ejected. No, this was not fratricide or fragmentation.

• After splitting for 1 vs. 1 night intercepts, the mishap flight lead and his backseat passenger felt and heard a series of violent, loud bangs. The wingman was 12 miles

continued on next page

away at this point but still saw sparks trailing the mishap aircraft. Restart attempts were unsuccessful, and the mishap crew was forced to eject at minimum vectoring altitude. They landed in 8 inches of 30-degree Fahrenheit water and stayed there over 2 hours waiting for rescue forces.

• A two-ship entered a low-altitude Military Operating Area to practice dry 10-degree/20-degree HI attacks. On the second element attack, No. 2's engine rolled back silently and flamed out. After a climb and brief airstart attempt, the MP bailed out over a dense forest. Luckily, he was able to land in an open area that had been logged recently.

• A four-ship was on a low-level practicing threat reactions and targeting/sorting. Suddenly, Blue 4 heard a thump, felt the airplane decelerate, and noticed smoke entering the cockpit. Analyzing an engine failure, the MP applied the CAPs but was unable to get a restart. He ejected successfully at low altitude.

• A single D-model was on a test chase mission over the Gulf of Mexico. After over 2 hours of flight, the pilots felt a series of loud bangs and severe airframe vibrations. The engine rolled back, and the front-seater attempted two airstarts. After determining the engine was not recoverable, both pilots successfully ejected.

Observations and Concerns

Ejections. Since accepting the Viper, we have attempted 199 ejections. Of these, 186 have been successful. This is a great record, but we are treading on thin ice! Having such a great seat is making the decision to wait a little longer a little easier. The seat is rated for zero feet, zero airspeed, but that is based on everything working perfectly. For the past 3 years, we have had a string of ejections below the 2,000-foot-AGL recommended minimum altitude—for no good reason! As a result, parachute landing fall (PLF) injuries are increasing because we aren't giving ourselves enough time to run the post-ejection checklist and prepare to land. This year, four of the pilots mentioned in the above mishaps bailed out below 2,000 feet—and I say again, for no good reason. If we keep this up, PLF injuries will stay high, and I'm afraid it's only a matter of time before a delayed decision, coupled by a glitch in the system, costs us one of our buddy's lives. Emphasize this in your EP training, SEPTs, and simulators from the perspective of the pilot having the emergency and the supporting wingman's perspective. Properly timed and phrased words from the wingman can help a flight member make a more timely ejection decision. In fact, several safety boards over the past 3 years mention this in their reports. I urge you to read or reread ALSAFECOM 07100ZMAR96, Mutual Support During Emergencies and the Ejection Decision, that discusses these issues in more detail.

Preparing for your next emergency. The USAF has experienced a total of 237 Class A's in the F-16. Four of these fall into the category of "non-rate producers," so most literature you'll see shows a total of 233 Class A's to date. To further muddy the water, the following statistics are *my* interpretation of what's in the HQ Air Force Safety Center database. Before calling me to argue about categorizing mishaps, realize there is a lot of subjectivity in doing so. I'll be happy to talk to you about it another time, but the purpose of this is to show you what phenomena have been present in these 237 Class A accidents. After reading the narratives and one-liners, I classify 106 of the 237 Class A's into the logistics category—90 of these mishaps are engine-related.

Based on this information, I would be ready to deal with an engine malfunction anyplace, anytime. You would think this is common knowledge, but apparently it's not. In at least five of the engine mishaps in the past 2 years, the pilot has done the CAPs slowly, incompletely, or out of order. I'm not pointing fingers or trying to talk down to you, and as a fellow F-16 driver, I know how mentally intense an emergency can be, but that's what CAPs are for. Know them, *know them*, **know them**, and be prepared to execute them on that next engine EP!

There's another point I'd like to make here, targeting that 10 percent who didn't get the message. There's a common misconception in the F-16 community about GE engines, and that is, "If a GE flames out, you have no chance of a restart." This is not true. ACC conducted a study and published a message stating that the likelihood of getting a successful air restart is as good as 20 to 30 percent. For complete details, read the 071954ZJUL97 Safety Crosstell, GE F110 Airstarts.

The human factor. There are several operations-related mishaps that have plagued the Viper community since Day 1. The scary thing about most of them is they cause a high percentage of fatalities. I categorize 116 of the 237 Class A's as operations-related mishaps.

This year we had two midairs, one spatial disorientation, one GLOC, and one out of control. This breakdown practically mirrors the lifetime statistics, but conspicuously absent was a pilot-induced flameout (fuel mismanagement), a Control Flight Into Terrain, and a takeoff/landing accident. I know these aren't more likely this year just because we didn't have one last year, but I'm a superstitious sort. Be wary, and do your best to train all of these out of existence. Thorough briefings and no holds barred, honest debriefings are the fighter pilot's main weapon in achieving this attainable goal. Three times this past year, a poor debrief from a previous flight, a poor brief on the mishap flight, or a combination of both, were a factor in an operations-related mishap. It's not a perfect world, but do what you can to keep the briefing/debriefing the best tactical learning tool and, thus, accident prevention tool we have in the F-16 community.

Summary

My goal was to summarize this year's mishaps and give you some thoughts and useful information for your safety programs. Hopefully, I've done that. If you have questions, comments, or need some information, you can reach me at DSN 246-0730 or e-mail me at [taylorw@smtps.saia.af.mil]. Fly safe and check six. ✈

F-117

Official USAF Photo

LT COL STEVE PRETESKA
HQ AFSC/SEFF

If you're vehement over rates, a mishap rate of 22.99 is pretty dramatic—particularly when the aggregate USAF rate is 1.37 for the same period. Hmmm, three Class A's in a year—are there common threads in these mishaps that oblige assertory action? Rates are revealing testament but do not always tell the whole story. What can we ascertain from the FY97 experience?

Mishap No. 1 involved a wind gust, a less than optimum "aerobrake" (taken from the AFI 51-503 reports), and publications that were less than complete or explicit. The doughty aviator employed an aerobrake technique that foreshadowed the precis so that when the headwind hit on landing roll, the combined wind and aircraft energy was enough to propel the mishap aircraft about 100 feet in the air, much to the chagrin of the MP. There being no such thing as a free lunch, or in this case, free energy, the wind shifted to a tailwind and down goes the Nighthawk to the demise of the nose gear and much of the nose structure.

Want more landing roll and gear adventure? Mishap pilot No. 2 was applying the binders to complete the otherwise normal full stop when a failure in the antiskid system disabled effective braking. Antiskid off, drag chute deploy, nose well steering engage, and brakes reapply were noneffective as Mr. Toad's wild ride ended with the barrier housing showing all three gear the meaning of respect. The MP egressed with a severe back injury.

The third and final (phew!) F-117 Class A of the year occurred over a runway too. Since the investigations are still ongoing, details aren't releasable yet. However, the news media provided air show footage that, amongst other things, initiates cardiac arrhythmia.

Protuberantly, it's incongruous to conclude that runways and F-117s don't mix. Here are some potentially more appropriate conclusions. The checks and balances that normally help catch errors and prevent mishaps require an extra amount of diligence by all. The program has been able to rely on a more elite and experienced cadre of operators and maintainers for this extra vigilance. However, the average age and experience level of the maintainers and pilots is dropping by necessity. These guys need as much documentation and standardization as supervision can afford to put in place. Youthful eudemia cannot make up for years of hard-won experience, professional maturity, and judgment. "Unique and different" doesn't extend far enough in negating the effects of physics and statistics!

In fact, there are remarkable similarities between this weapons system and, for example, the experiences of the U-2. Everyone interested in enhancing the safety quotient of these two weapons systems should take advantage of the other's learning curve. There is ample opportunity to "share the wealth" between the F-117, U-2, and also the B-2 and the new F-22. One base, small numbers of aircraft, the shift from a more experienced cadre to a "looks like the rest of the USAF," and a more intimate relationship with the contractor all bode the same advantages with the same risks. ✈

Helicopters

Official USAF Photo

LT COL JAY JOHNSON
HQ AFSC/SEFO

A very successful year for every MDS, crewmember, and maintainer—across all of the commands. No Class As or Bs, only 16 Class Cs, and 4 HAPs. The only real trend was PJs getting hurt when doing their PLFs. In the H-60 world, we had two hoist cable breaks, but from my perspective, the hoist is in good shape. We could, though, use more scientific research into how the operator can induce overload on the cable due to either poor technique or lack of proficiency (this goes for the pilot's hovering also) and just when to replace the cable on a cycle-based time change. Everyone take a well-deserved "Hoooooorah" and then back to business as usual.

Well, no one thought it would be that easy, did they? No way my boss lets me get away with a two-paragraph end-of-the-year article, so let me share some observations with all of you out there at the tip of the spear.

I'd like to cover three interrelated areas: Fatigue, Stress, and Complacency. By itself, any one of these conditions can cause a major mishap, and in combination can be deadly. Because of deployment schedules, training requirements, and plain old everyday work activities, our crewmembers are stretched pretty thin. Come to think of it, so are the supervisors. PERS and OPTEMPO are not decreasing and, in fact, are increasing. Spinning up to deploy and spinning back down only to spin back up again—a vicious, seemingly never-ending cycle, isn't it? Have you met yourself coming and going at work, and worse yet, is the same thing happening in your personal life?

Commanders, ops officers, and maintenance officers, take heed—your people are tired. You can see it if you look closely at your daily operations. Not just tired from TDYs or long days, but FATIGUED, which is insidiously dangerous.

A recent sleep study at the University of Pennsylvania recorded data that definitely applies to the entire helicopter community. During this study, the subjects (read crewmembers for us) got only half the amount of normal sleep for 10 days (sound like a typical NVG cycle to anyone?) and were given tests which showed clearly measurable effects on virtually all aspects of functioning. Declines in reaction time (not too important at 50 feet AGL) and increases in lapses (read degraded crew coordina-

tion) soared after the second night on the sleep-deprived schedule.

The good news is that the deficits stabilized (although at the decreased level) for the next 4 to 5 days, showing we do adapt to sleep loss. But after the sixth or seventh day, the deficits rose again. The good news is that it took only 2 nights of normal sleep to regain initial conditions. The bad news is that we seldom have the luxury of enough people to let crews take 2 days off to reset sleep cycles.

Here comes the new buzz phrase "ORM"! "Oh no, Mr. Bill, not again!" (I'm dating myself with ancient SNL skits.) Yes, Mr. Bill, there are steps that, if taken, can mitigate the problem. Just being aware of the hazards will help supervisors make the right choices and prevent putting a crew in a bad situation. Only those supervisors with direct contact can truly measure the risk of maintaining the status quo. As you've read earlier, the effects of fatigue are cumulative, so over a long period of time, you just might be boxing your crews into a corner from which they cannot recover. The worst result of doing nothing is getting the call about an overdue (hope it was a precautionary landing) or missing aircraft. Ask some friends you know what that phone call feels like.

Now let's throw stress into the equation. Safety Center research (yes, we actually went into the field and asked real crewmembers questions) came up with data that might make some of you uncomfortable. If so, you're exactly the audience I'm aiming for. The crewmembers surveyed were from all MAJCOMs (including the ARC) and ranged from E-1s to O-5s. The preliminary findings show additional duties unanimously cited as safety hazards, deployment scheduling, experience, training, and proficiency were major concerns, and promotion and retention issues (money was not the problem, and most felt insulted that anyone would think they were in the business for money). Family services issues were also a big concern. The most shocking results were: a perceived lack of trust in leadership; accountability (fear/mistrust); and a lack of loyalty down the chain.

Whether you believe this data or not, it is real and causes tremendous stress on everyone. It is incumbent on leadership to acknowledge the perceptions and actually do something to visibly affect change. The first place the stress becomes evident is in one's personal life (because we're all so good at compartmentalizing at the job), and by the time you notice the stress at work, real problems exist.

It's also incumbent on crewmembers to let leadership know if they see problems developing so leadership can take appropriate actions to prevent accidents (come on, people, give the DO and CC a chance—they just might surprise you). It's a two-way street. If I could supply you with ready-made solutions, I'd be making the big bucks in the private sector as a consultant. All I'm trying to say is, "Be aware; don't just hope nothing happens on your watch."

This brings me to the last subject: complacency—defined as a feeling of contentment or satisfaction; gratification or self-satisfaction. Complacent is defined as contented to a fault. Some related words and phrases are smug, at ease, indifferent, apathetic, nonchalant, unworried, impervious. Does this sound like anyone you know or work with on a daily basis? If so, let your flight commander, DO, or CC know ASAP. The helo doesn't crash in compartments.

Where does complacency come from? People smarter than me say usually two sources. One is the inability or failure to see what's changed. The second comes from being too familiar with your surroundings.

Now for the punch line. Why does complacency happen? Part of it is that humans are inherently lazy. Before you get angry, I didn't say or mean slothful. The human brain and body naturally seek out the path of least resistance. When an action or surroundings become "routine," the conscious part of the brain starts to ignore so it can concentrate on other things.

The only way to combat complacency is to constantly fight it. Be diligent and pay attention to details. In a familiar situation, play games with your brain to keep it active. The problem with combating complacency is it's pretty tough to fight it when you're fatigued and stressed to the maximum.

For you commanders and ops officers out there, I know the policy is "Don't fly unless you're ready," and that all of you support the policy. But crewmembers are like kids. "Do as I say, not as I do" doesn't work. You're the leaders, and they do follow your example.

Mentally, put yourself in the following situations: How many times have you been late to the brief or unprepared at the brief? How many times have you let the copilot plan the mission because you didn't have time? How many times have you cut the debrief short because of other pressing duties? I could go on and on, but you get the picture. If you really want your crews to feel comfortable about canceling or cutting a flight short for any reason, you need to set the example. How about canceling one of your flights when you meet one of the criteria above and ***not*** letting the scheduler scramble to fill the sortie. Crews see what you DO! Just a suggestion.

The bottom line is fatigue and stress are parts of a very dangerous mixture that foster complacency. Everyone has the responsibility to ensure that this combination is never mixed and a mishap occurs. Almost all of us can say, "Been there, done that, got that T-shirt," and most of us are still around due to the grace of God, skill, and luck.

But some of our friends didn't come back because of a myriad of factors. Think back. Was there something you saw or felt and then just shook your head and said, "Nah, they'll be okay. They're too good a pilot (or FE or PJ) to make a fatal error in judgment." You are as responsible for intervening in a dangerous situation as a copilot (or FE or PJ) as are the DO or Commander, and you need to step up and make the hard calls when they need to be made.

"Knock it off" is just as important a phrase, if not more so, than "Fly Safe." ✈

Trainers 1997

MAJ JEFF THOMAS
HQ AFSC/SEFF

Recently, while visiting the "Boneyard" at Davis Monthan AFB, Arizona, I noted the desert was well stocked with retiring T-37s and T-38s. It seemed premature to see so many Tweets and Talons "grounded" while their stablemates continue to admirably soldier on, not only admirably, but safely! To put FY97 in perspective, the trainer community experienced two Class A mishaps, exactly half the total number of T-38 Class A mishaps just 10 short years ago. Except for some less-than- subtle variations, FY97 mirrored FY96 in the trainer community. If you had the opportunity to read last year's trainer review, you may note some blatant plagiarisms in this year's review culled directly from last year's pages.

T-37

In FY97, the T-37 community experienced one Class A mishap, bringing the Tweet's last 10-year totals to six Class A mishaps. To put that figure in perspective, in its first 10 years of operation (calendar years 1957-1966), the T-37 was involved in 73 Class A mishaps. So while one mishap may seem like a lot, we've come a long way in reducing our totals! In fact, the T-37 has continuously enjoyed a low mishap rate since the mid-sixties. After some early teething problems resulted in rates hovering between four and nine mishaps per 100,000 hours, the Tweet has settled down to enjoy rates of less than 1.0 almost consistently since CY66.

Since the late 1950s, the T-37 has logged over 12 million flying hours. During that period, the T-37 has been involved in 133 Class A mishaps for a lifetime rate of 1.11 per 100,000 flying hours. The 133 Class A mishaps resulted in 131 aircraft destroyed and 75 fatalities. Since 1980, the rate of operator-caused Class A mishaps has exceeded logistics-caused mishaps three to one, with operator-induced loss of control as the leading cause factor. In fact, a logistics-caused T-37 Class A mishap hasn't occurred since the late 1980s. Recent operator-induced mishaps include a midair while flying formation, collision with the ground while performing an unauthorized "airshow," loss of control after a trim malfunction, and loss of control following an unsuccessful unusual attitude recovery. From this listing it appears the T-37 "weak link" might be the control stick actuator (i.e., pilot).

The one FY97 T-37 Class A mishap resulted in an overall rate of 0.62 for FY97 based on162,442 total flying hours. According to the 51-503 Accident Report, the mishap crew struck an unlit raised approach end barrier at the homedrome at night while attempting an opposite direction approach to verify recently repaired runway lighting. As the mishap aircraft approached the runway threshold, it engaged the top of the unlit BAK-15 barrier which was in the raised position. (The BAK-15 is a large web barrier 13 to 23 feet high which spans the entire width of the overrun.) The barrier contact separated the nose wheel, torque link assembly, the lower portion of the nose strut, and both nose gear doors. The engagement slammed the aircraft firmly onto the overrun, and it slid along the runway until it departed off the right 1,000 feet from the threshold. After stopping, both pilots successfully ground egressed as the aircraft began to burn.

While the end is in sight for the venerable old bird as we edge closer to fielding JPATS, the Tweet still needs to be treated with "tender luvin' care" as it approaches retirement. While highlighting the increasing number of operator-caused Tweet Class A mishaps, you need to be aware the T-37 has developed some "idiosyncrasies" as it approaches its "golden years" that require aircrew and maintainers to be vigilant. Certain themes continue to recur in Class C mishap reports. In FY97, there were 102 reported Class C mishaps of which 40 involved engine flameouts and 24 involved intentional shutdowns.

Engine problems and the Tweet seem inseparable. Thirty years ago, the T-37 *Aircraft Accident Summary* for 1967, published by the Directorate of Aerospace Safety, stated "There were 222 incidents reported...37 of these incidents involved engine flameouts, 112 intentional shutdowns." The summary went on to say "Oil system, fuel control, and fire warning malfunctions were leading

contributors to the high incident rate." As was the case 30 years ago, today over half of the reportable T-37 incidents involve engine-related problems/malfunctions.

As stated last year, historically, flameouts have been caused by operator techniques, material failures, and, invariably, aging components. While no single cause factor has been pinpointed for the flameouts, several issues are being worked to reduce their probability.

A modified Main Fuel Control (MFC) is currently being tested which will increase fuel flow settings at idle power. After testing, the MFCs will be installed in test aircraft for further testing before the determination is made for full-scale fleet retrofit. Additionally, SA-ALC recently sanctioned the use of JP-8 + 100 fuel in the J-69. This may reduce the buildup of carbon deposits in the engines, but the jury will be out on this for a while. Not an overnight "cure-all," the use of + 100 fuel is still in its infancy, and time will be required to see if its use has the desired benefits. Finally, while maintenance folks are working hard to resolve the flameout issue, when material factors aren't involved, duplication of exact flight parameters (rate of throttle movement, pitch attitude, OAT, etc.) which existed at the time of the flameout make troubleshooting a difficult undertaking at best.

Finishing No. 2 in FY97 (and FY96) for the T-37 in terms of Class C mishaps was engine shutdowns. Twenty-four shutdowns were reported in FY97, approximately 50 percent of which involved oil-pressure problems (fluctuating, zero, etc.), while the majority of the remainder involved malfunctions in the fire detection circuitry.

At the risk of not wanting to appear to restate the obvious, of the 102 reported Class C mishaps, 64 involved some type of engine problem/malfunction. I said it last year, and I'll say it again this year—the situationally aware aviator would be particularly sharp when it comes to possible engine and associated system malfunctions, as well as proficient in single-engine procedures.

One new issue which surfaced in FY97 was gear-up landings. After no recorded gear-up landings since July 1994, three were recorded in FY97. Interestingly, two of the gear-up landings involved solo students and were due to an inability to lower the gear, while the third involved two instructor pilots who forgot to lower the gear following an overhead pattern. Bottom line: Engines aren't the only things that can "go awry." Expect and be prepared for the unexpected as the Tweet gets "long in the tooth."

T-38

Ten years ago, the FY86 *Flying Safety* magazine T-38 review stated, "If there is anything monotonous about the T-38, it's how well it performs year after year. Once again...the Talon proved to be a remarkably safe and extremely reliable aircraft...In 1986, we experienced four Class A mishaps in the T-38." Those words are as equally applicable today as in 1986, with one major exception: For the first time since FY94, and only the second time in its history, the T-38 ended the fiscal year with no mishaps. That's a real testament to those who fly and maintain the "white rocket" in the demanding, potentially unforgiving world of teaching fledgling aviators.

Hard to believe, but it has been 25 years since the last AETC T-38 entered the inventory. Looking at the Talon's mishap history, not only has the number of mishaps come down annually, but the rate per 100,000 flying hours has also decreased.

Year	# of Class A Mishaps	Rate
CY67	13	2.91
CY77	8	2.37
TY87	2	0.75
FY97	0	0.00

After all the back-slapping and high fives over this improvement have subsided, remember—there's still no room to get complacent. Like the T-37, the T-38 is not without its quirks.

In the almost 35 years since the first pilot training class earned their wings flying the T-38, the Talon has flown over 12.1 million hours with an impressive overall mishap rate of 1.58 Class A mishaps per 100,000 flying hours. During the Talon's lifetime, there have been 189 Class A mishaps, resulting in 182 aircraft destroyed and 134 fatalities. Although historically operator-caused mishaps have outnumbered logistics-related mishaps almost two to one, recent experience has shown a change in the trend to reflect an increasing number of Class A mishaps due to compressor rotor problems (FY93/95) and bird strikes (FY92/two in '93), with the last operator-caused Class A mishap occurring in FY91.

To mitigate the former risk, the T-38 community is exploring the possibility of redesigning the disk or compressor, with an implementation, if approved, of approximately 1999/2000. The bird strike hazard has been reduced by acquisition of a new polycarbonate laminate bird-resistant windscreen rated to 400 knots for a 4-pound bird as compared to the older windscreens' 210-knot/4-pound limitation. As of this writing, procurement and installation are approximately 90 percent

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complete, with final wrap-up expected in early FY98. Already this windscreen has demonstrated its worth when a T-38, flying a low level at approximately 500 feet AGL and 350 knots, impacted a bird on the windscreen which withstood the collision and allowed safe recovery of the Talon and its occupants.

Like the T-37, the T-38 also has a recurring Class C mishap trend—engines. Of the 79 reported Class C/HAP events in FY97, 28 involved engine flameouts, while 13 involved engine shutdowns for reasons which included false fire lights, loss of oil pressure, failed gear box, etc. T-38 aviators know the J-85 has always been touchy when operated near the edge of the envelope and, as the engine ages and tolerances increase, will probably become more irritable. Like the T-37, J-85 flameouts have historically been related to operator technique, material factors, and component age. And like J-69 flameout troubleshooting, when material factors aren't involved, duplication of exact flight parameters which existed at the time of the flameout make trouble shooting to find the exact cause a difficult undertaking. Operator techniques like monitoring throttle movements when near the edge of the envelope and paying attention to critical factors like OAT may help reduce the rate of unintentional single engine operations. Like the T-37, SA-ALC recently sanctioned the use of JP-8 + 100 fuel in the J-85. This may reduce the buildup of carbon deposits in the engines, but the jury will be out on this for a while. Not an overnight "cure-all," the use of + 100 fuel is still in its infancy, and time will be required to see if its use has the desired benefits.

Like the T-37, the smart Talon operator would pay close attention to engines and their related systems, while maintaining proficiency, not just currency, in single-engine procedures.

T-1

The T-1 experienced another stellar year in FY97. There were no Class A mishaps for a continuing lifetime rate of 0.00. In fact, there were no Class B mishaps recorded in FY97 either, which means since its introduction at Reese AFB in 1992, the T-1 has been Class A and Class B free in its approximately 199,750 flying hour history.

Seven Class C/HAP mishaps were recorded by the T-1 fleet in FY97, compared to four in FY96. As in FY96, the majority involved engine problems. Two incidents involved intentional engine shutdowns in flight, one involved a flameout during taxi, the fourth involved an engine-damaging bird strike. Unlike FY96, none involved inadvertent engine shutdowns. Of note, the nose gear landing light problem, with its associated high airframe damage/engine FOD potential, first reported as a HAP in FY96, has been resolved with the acquisition of new light assemblies.

Modifications on the horizon for the T-1 include the installation of a fully integrated GPS into the Flight Management System (FMS). The prototype GPS aircraft is scheduled to arrive at Randolph in late CY97 for validation and verification of the setup and student training requirements. Installation fleet-wide should be completed sometime in FY99. As stated in last year's trainer review article, integration of GPS will result in the highly automated T-1 becoming even more computerized. Due to the high degree of computerization present in the Jayhawk, the potential for "automation confusion" exists when you've called up a function that doesn't look familiar or you're not too proficient with. Remember, automation has not changed the fundamentals of airmanship; fly the aircraft first! Don't let all cockpit crewmembers (jump seat included) be "heads down" trying to resolve some unintelligible display or trying to figure out how to program/reprogram the Flight Management System. "One pilot handles the FMS, the other handles the aircraft" needs continuing emphasis during briefings and training due to the potential for the above highlighted automation dilemmas.

T-3

Unfortunately for the Firefly, FY97 was not the best of years. As in FY95 and FY96, the T-3 community experienced one Class A mishap in FY97 which tragically resulted in two fatalities. As of the writing of this article, the 51-503 Accident Investigation Board results had not been released. The known, releasable facts are that the aircraft was on a routine training mission when the aircraft crashed on the turn from crosswind to outside downwind, fatally injuring the instructor pilot and Air Force Academy cadet student pilot.

In FY97, the T-3 flew a total of 32,453 flight hours for a lifetime cumulative total of 88,515. Unfortunately, since becoming the T-41 replacement in FY94, the Firefly has experienced three Class A mishaps, resulting in six fatalities. This has resulted in a lifetime Class A rate of 3.39.

In FY97, the T-3 fleet experienced *17* Class C mishaps. As in FY95 and FY96, the vast majority of reportables involved uncommanded engine shutdowns on the ground pre- or post-mission. However, there were a handful in flight at various points in the mission profile. Changes had been made in engine break-in, acceptance, set-up, and starting procedures, while fuel line shielding, oil cooler, and cowling modifications had been undertaken in an attempt to further mitigate the risk of engine stoppages. Despite these efforts, uncommanded engine shutdowns continued with the Firefly. As of late July 1997, AETC suspended T-3 operations in an attempt to come to final resolution of the T-3's continuing engine woes. ✈

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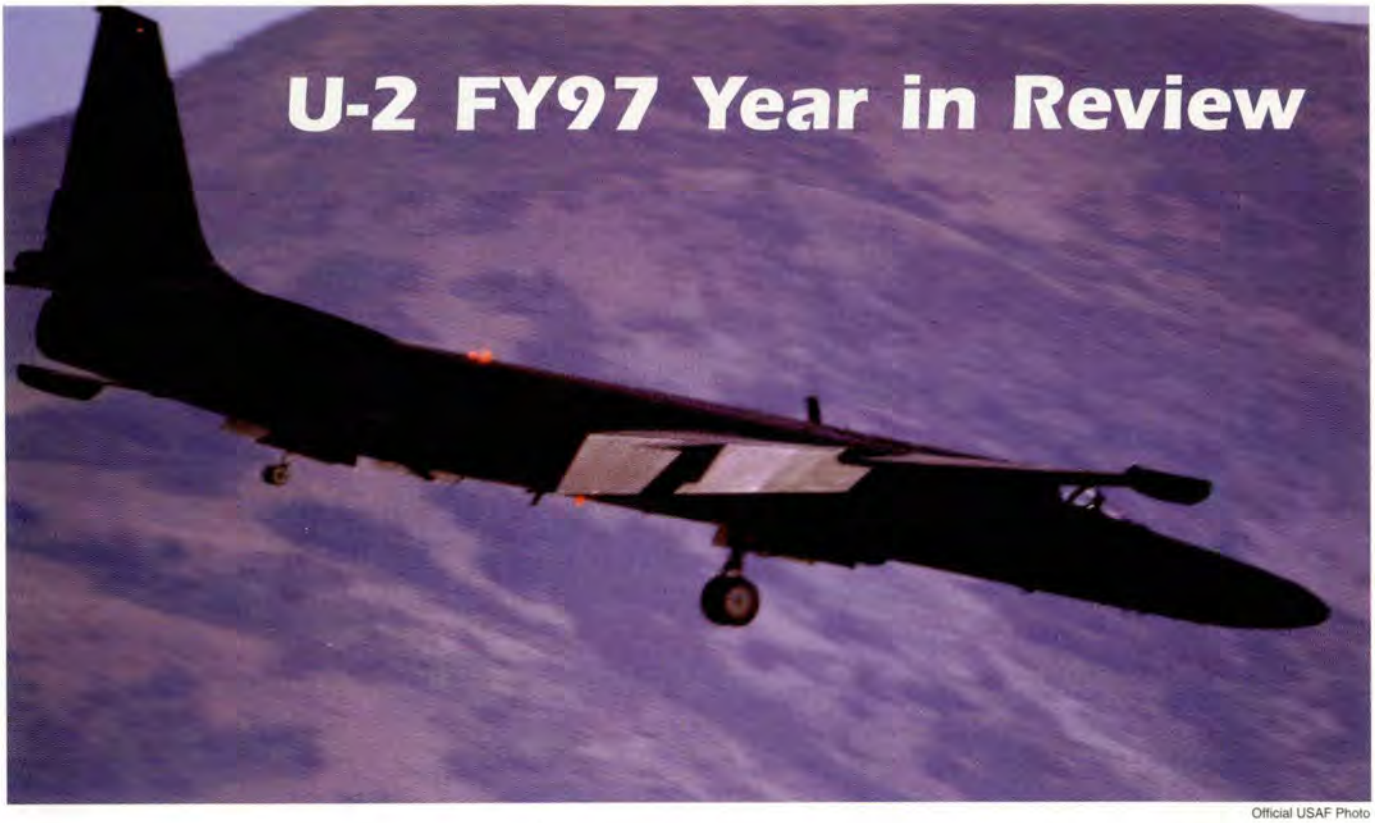
U-2 FY97 Year in Review



Official USAF Photo

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The U-2 program has a trend of one Class A mishap per year over the last 8 years. Half of these have resulted in pilot fatalities. The last two mishaps have largely resulted from maintenance and/or logistics shortcomings. The recommendations from these mishaps, along with all previous mishaps, are being actively pursued by the Air Force Safety Center, HQ ACC, Warner Robins-Air Logistics Center, the 9th Reconnaissance Wing (9RW), and the reconnaissance program office at Aeronautical Systems Center. The combined efforts of all these organizations will ensure the aircraft is able to fly well into the next century.

The aircraft of today are much more reliable than earlier versions. This is particularly true of the new U-2S, featuring upgraded avionics and the new F118 GE-101 engine. However, most of the U-2's systems were designed primarily for minimal weight, high altitude, and long range, not Air Force aircraft Mil Spec standards. This fact alone creates a very challenging situation in which to operate and maintain this aircraft.

The U-2 aircraft, operations, and maintenance personnel continue to serve at deployed locations around the globe. At any one time, the 9 RW has roughly one-third of its pilots and maintenance personnel and half of its aircraft deployed to these worldwide locations. Unified Commanders in Chief employ the U-2 and its myriad of sensors to meet a variety of theater and national level taskings. These taskings occur almost daily along with required training sorties which maintain the combat readiness of all personnel associated with the 9 RW. Unique elements of the program, such as use of high-speed chase cars on the runway as the aircraft is landing and long-duration sorties in the full pressure suit, make unusual demands on the pilots, maintenance, and support teams. However, these unique elements also contribute to the intense unit pride seen at these locations. Typically, operations around the world are delivering a high number of sorties and intelligence products with a very small number of highly motivated people while creating a minimal site presence.

The U-2 program is a prime candidate for the application of Operational Risk Management (ORM). During the winter of 1996, an aircraft was taxied into an unlighted gatepost at an overseas location, resulting in puncture damage to an outboard fuel tank. In the investigation, the facts about the poor airfield lighting and high operating tempo pointed to the need for a risk control strategy that better balances the need for the intelligence products with the relative risk to the aircraft and pilot.

The U-2 is a true "National Asset," but the likelihood of producing more airframes is very low. With no new airframes and many "one of a kind" sensor packages, the challenge for the foreseeable future is one of aggressively identifying the hazards and risks within the program, reducing them when possible, and then balancing remaining risks with the never-ending need to collect and disseminate intelligence information. ✈

Seasons Greetings and Best Wishes
for a Happy and Very Safe New Year
From the Staff of Flying Safety Magazine